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THE SANITARY INSTITUTE, INCORPORATED 1888.
SALUS GENERIS HUMANI.

1891.

TRANSACTIONS

OF

THE SANITARY INSTITUTE.

VOLUME XII.

(Being the Third Volume of Transactions published since the Incorporation of The Institute.)

1891.

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—
1892.

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PREFACE.

The usual Autumn Congress not having been held in 1891, in consequence of the Meeting of the International Congress of Hygiene and Demography, the present Volume of Transactions is exceptionally small.

The Classified Catalogue of the contents of the Museum has been included in the Volume, as it will probably be found useful for reference.

Congresses held by the Institute.

LEAMINGTON, 1877.

President.—B. W. RICHARDSON, M.D., LL.D., F.R.S.

Presidents of Sections.

Section I.—Edwin Chadwick, C.B.
„ II.—George Wilson, M.A., M.D., F.C.S.
„ III.—R. Brudenell Carter, F.R.C.S.

STAFFORD, 1878.

President.—EDWIN CHADWICK, C.B.

Presidents of Sections.

Section I.—B. W. Richardson, M.D., LL.D., F.R.S.
„ II.—Henry Day, M.D., F.R.C.S.

CROYDON, 1879.

President.—B. W. RICHARDSON, M.D., LL.D., F.R.S.

Presidents of Sections.

Section I.—Alfred Carpenter, M.D., M.R.C.P.Lond., C.S.S.Camb.
„ II.—Captain Douglas Galton, R.E., C.B., D.C.L., F.R.S.
„ III.—G. J. Symons, F.R.S.

EXETER, 1880.

President.—THE RIGHT HON. EARL FORTESCUE.

Presidents of Sections.

Section I.—Prof. de Chaumont, M.D., F.R.S.
„ II.—R. Rawlinson, M.Inst.C.E., C.B.
„ III.—Sir Antonio Brady.

NEWCASTLE-UPON-TYNE, 1882.

President.—CAPT. DOUGLAS GALTON, R.E., C.B., D.C.L., F.R.S.

Presidents of Sections.

Section I.—Denis Embleton, M.D., F.R.C.S.
„ II.—H. Law, M.Inst.C.E.
„ III.—Arthur Mitchell, M.A., M.D., LL.D., F.R.S.

GLASGOW, 1883.

President.—PROF. G. M. HUMPHRY, M.D., F.R.S.

Presidents of Sections,

Section I.—Prof. W. T. Gairdner, M.D., LL.D.
„ II.—Prof. T. Roger Smith, F.R.I.B.A.
„ III.—R. Angus Smith, Ph.D., F.C.S.

DUBLIN, 1884.

President.—SIR ROBERT RAWLINSON, C.B.

Presidents of Sections.

Section I.—T. W. GRIMSHAW, M.A., M.D.
„ II.—C. P. COTTON, M.INST.C.E.
„ III.—CHARLES A. CAMERON, F.R.C.S.I.

LEICESTER, 1885.

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„ III.—WILLIAM MARCET, M.D., F.R.MET.SOC., F.C.S. F.R.S

YORK, 1886.

President.—SIR SPENCER WELLS, BART.

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„ II.—BALDWIN LATHAM, M.INST.C.E., F.R.MET.SOC.
„ III.—WILLIAM WHITAKER, B.A.. F.G.S.

BOLTON, 1887.

President.—RIGHT HON. LORD BASING, F.R.S.

Presidents of Sections.

Section I.—PROF. J. RUSSELL REYNOLDS, M.D., F.R.S.
„ II.—PROF. T. HAYTER LEWIS, F.S.A., F.R.I.B.A.
„ III.—PROF. A. DUPRÉ, PH.D., F.I.C., F.C.S., F.R.S.
Conference of M.O.H.—PROF. W. H. CORFIELD, M.A., M.D.

WORCESTER, 1889.

President.—G. W. HASTINGS, M.P., J.P.

Presidents of Sections.

Section I.—GEORGE WILSON, M.A., M.D.
„ II.—HENRY J. MARTEN, M.INST.C.E.
„ III.—J. W. TRIPE, M.D., F.R.C.P. F.R.MET.SOC.
Conference of M.O.H.—PROF. W. H. CORFIELD M.D.

BRIGHTON, 1890.

President.—SIR THOMAS CRAWFORD, K.C.B., M.D.

Presidents of Sections.

Section I.—G. VIVIAN POORE, M.D., F.R.C.P.
„ II.—PROF. T. ROGER SMITH, F.R.I.B.A.
„ III.—WILLIAM TOPLEY, F.R.S., F.G.S.
Conference of M.O.H.—ARTHUR NEWSHOLME, M.D., D.P.H.
Conference of Inspectors of Nuisances—ALFRED CARPENTER, M.D., M.R.C.P. D.P.H.

THE SANITARY INSTITUTE.

FOUNDED 1876.—INCORPORATED 1888.

REPORT OF THE COUNCIL,

Read at the Ordinary General Meeting, March 17th, 1891.

In presenting their Fourth Report to the Fellows and Members, the Council are glad to record that their anticipations with regard to the growth and development of the Institute have been fully realised.

SESSIONAL MEETINGS.

Sessional Meetings were held in February, March and April. The following papers were read and discussed:—

"Dwellings for the Labouring Classes," by KEITH D. YOUNG, F.R.I.B.A.

"The Sanitary Condition of Japan," by Prof. W. KINNINMOND BURTON.

At the Meeting in April an Address was given by Sir ROBERT RAWLINSON, dealing principally with the Sanitation of Barracks and of other Public Buildings. After the Address the Medals and Certificates awarded at the Worcester Exhibition were presented to the successful Exhibitors.

LENT LECTURES FOR LADIES.

A course of Lectures on Domestic Hygiene, especially intended for

Ladies, was given during Lent by Dr. A. T. Schofield, and included the following subjects :

"The Training of Children."

"Flesh and Blood."

"The Ethics of Life."

"Nerves in Order and Disorder."

Her Royal Highness the Duchess of Albany, Patroness of the Institute, was present at all the Lectures, which were very largely attended, and at a special meeting held at the close of the course, Her Royal Highness presented Certificates to 27 Ladies who had written satisfactory reports upon the Lectures.

LECTURES FOR SANITARY OFFICERS.

Two courses of Lectures and Demonstrations for Sanitary Officers have been held during the year. The first course, held in February and March, comprised the following Lectures :—

Introductory Lecture. "Practical considerations for Sanitary Officers." E. C. Robins, f.s.a., f.r.i.b.a.

"Water Supply, Drinking Water, Pollution of Water." Dr. Louis Parkes, d.p.h. (Lond.)

"Drainage and Construction." Prof. H. Robinson, m.inst.c.e.

"Ventilation, Measurement of Cubic Space, &c." Sir Douglas Galton, k.c.b., d.c.l., ll.d., f.r.s.

"Sanitary Appliances." Prof. W. H. Corfield, m.a., m.d. (oxon.)

"Scavenging, Disposal of Refuse and Sewage." Charles Jones, assoc.m.inst.c.e.

"Food (including Milk), Sale of Food and Drugs Act." Charles E. Cassal, f.c.s., f.i.c.

"Infectious Diseases and Methods of Disinfection." Shirley F. Murphy, m.r.c.s.

"General Powers and Duties of Inspectors of Nuisances ; Method of Inspection." J. F. J. Sykes, m.b., b.sc.

"Nature of Nuisances, including Nuisances the Abatement of which is Difficult." J. F. J. Sykes, m.b., b.sc.

"Diseases of Animals in Relation to Meat Supply." A. Wynter Blyth, m.r.c.s.

"Sanitary Law. General Enactments, Public Health Act, 1875, Model Bye-Laws." A. WYNTER BLYTH, M.R.C.S.

"Sanitary Laws and Regulations Governing the Metropolis." A. WYNTER BLYTH, M.R.C.S.

The second course, held after the revision of the Syllabus of the Examinations, was considerably extended, the following Lectures being added, and that on "Food" omitted as only partly applicable to the duties of an Inspector :—

"Principles of Calculating Areas, Cubic Space, &c.; Interpretation of Plans and Sections to Scale."

"Sanitary Building Construction."

"Details of Plumbers' Work."

"Objects and Methods of Inspection."

"Trade Nuisances."

"Diseases of Animals in relation to Meat supply; Characteristics of Vegetables, Fish, &c., Unfit for food."

The sixteen Lectures comprised in the course were given by :—Sir DOUGLAS GALTON, K.C.B., D.C.L., LL.D., F.R.S.; H. LAW, M.INST.C.E.; LOUIS PARKES, M.D.,D.P.H. (LOND.); Prof. H. ROBINSON, M.INST.C.E.; KEITH D. YOUNG, F.R.I.B.A.; Prof. W. H. CORFIELD, M.A., M.D. (OXON.); J. WRIGHT CLARKE; CHARLES JONES, ASSOC.M.INST.C.E.; SHIRLEY F. MURPHY, M.R.C.S.; J. F. J. SYKES, M.B., B.SC., D.P.H. (three Lectures); A. BOSTOCK HILL, M.D., S.SC.C.CAMB., F.I.C.; A. WYNTER BLYTH, M.R.C.S. (three Lectures).

Two hundred and forty-seven Students entered their names for these Lectures. The Council desire to record their sincere thanks to the Lecturers for the great benefits they have conferred upon the Students by the preparation and delivery of these Lectures.

EXAMINATIONS.

During the year two Examinations for Inspectors of Nuisances and one for Local Surveyors have been held in London, and Examinations for Inspectors of Nuisances have also been held at Bristol and Leeds. At these Examinations 307 candidates have presented themselves for examination as Inspectors of Nuisances, and eighteen as Local Surveyors; 151 have received Certificates of Competency as regards their Sanitary knowledge to discharge the duties of Inspectors of Nuisances, and eight those of Local Surveyors.

Since these Examinations were first established, thirty-three examinations have been held, and 1,132 candidates have been examined, of whom 587 have passed the Examination for Inspectors of Nuisances, and 70 that for Local Surveyors.

The Council believe that the new practice of holding Examinations in the provinces has done much to strengthen the position of the Institute and to awaken Local Authorities to the necessity of appointing duly qualified officers. An increasing number of Local Authorities prefer that their Inspectors should hold the Certificate of the Institute.

During the year the Syllabus of the Examination for Inspectors has been revised and re-arranged to accord with the General Orders issued by the Local Government Board, and the Council have now under consideration a further development of the Examinations.

CONGRESS AND EXHIBITION.

The Annual Congress was held at Brighton (by the invitation of the Town Council) under the Presidency of Sir Thomas Crawford, K.C.B.

The Institute was very well received, and ample accommodation was provided for the meetings in the Buildings of the Royal Pavilion, which were placed at the disposal of the Institute by the Corporation. Nearly 200 Members and Associates of the Institute were present, as well as 240 holders of Congress tickets, and invited guests. Vol. XI. of the Transactions already issued to the Members contains a full account of the papers read in the various Meetings.

A Conference of Medical Officers of Health was held in connection with the Congress, and was well attended.

A Conference of Inspectors of Nuisances was also held in connection with the Congress, and was much appreciated by those Sanitary Officers as a means of discussing matters particularly connected with their duties.

The Exhibition was held in the Dome of the Royal Pavilion, and in the Corn Exchange, and was open eighteen days. It was visited by about 35,000 persons. There were 108 exhibitors, the Judges awarded twenty-three medals and sixty-seven Certificates, and sixty-seven exhibits were deferred for further trial.

PARLIAMENTARY WORK.

Suggestions with reference to the Draft Public Health Consolidation Bill were sent to the Local Government Board. It was

also decided to petition against the Architects' Registration Bill and against the Sanitary Registration of Buildings Bill; and in favour of the Housing of the Working Classes Bill and of the Infectious Diseases Prevention Bill. Suggestions on the Public Health Amendment Bill and on the Urban Sanitary Authorities further Extension of Powers Bill were prepared for the promoter for him to bring forward in Committee.

ARRANGEMENT OF MUSEUM.

The International Congress of Hygiene and Demography will meet in London in August, 1891. This is the first time that this important Congress has been held in London, and it was on an invitation given jointly by the Institute and the Society of Medical Officers of Health that the meeting was arranged to be held in this country. This interesting meeting will naturally attract considerable attention to the Institute and the Parkes Museum, and the Council felt it very important to place the Museum in good order before the meeting. Want of funds has hitherto prevented the Council undertaking this much-needed work, and even now they would have been unable to devote an amount anything like adequate for the purpose. Under these circumstances Mr. Rogers Field, to whom the Council are indebted for much other assistance given to the Museum, has generously offered to place at the disposal of the Council the sum of £250, which will suffice, not only to put the Museum in thoroughly good order, but also to make several very desirable improvements and to prepare and print a Catalogue.

MUSEUM.

During the year the Museum has been visited by about 9,000 persons.

Several appeals have been received from India and the Colonies for assistance in starting Sanitary Museums.

Considerable use has been made of the Museum by Professors and Teachers for the purpose of practical demonstrations to their classes. Twenty-four classes of this kind have been held, mustering altogether 276 Students.

In July the Council decided to abolish all charge for admission, and to throw open the Museum entirely free to the public, except when meetings and lectures were taking place.

LIBRARY.

The use of the Library is steadily increasing; during the year there have been 475 readers.

252 volumes and pamphlets have been added to the Library during the year. A list of these will be found in Vol. XI. of the Transactions.

BY-LAWS.

A slight alteration has been made in the By-laws relating to the supply of publications to Associates, and revised copies have been issued.

EPITOME OF REGISTERS OF MEMBERS AND ASSOCIATES.

	Hon. Fellows.	Fellows.	Members.	Associates.	Total.
Dec. 31, 1889.....	—	134	416	211	761
Elected	+28	+19	+47	+128	+222
Transferred	—	—	–19	–5	–24
Resigned	—	—	–9	–4	–13
Erased	—	—	–8	—	–8
Dead	—	–2	–4	–1	–7
Dec. 31, 1890.....	28	151	423	329	931

The Council are glad to note this rapid and continued increase in the Institute.

It is with much regret that the Council have to report the death of the veteran Sanitarian, Sir Edwin Chadwick, K.C.B., and of Dr. W. Pearce Fellows, S. J. Barber, H. Branthwaite, Viscount Templetown, and J. H. Walker, Members; and T. Thomas, Associate.

FINANCIAL STATEMENTS.

The Council append to this report a complete statement of the Income and Expenditure for the year ended December 31st, 1890, with a separate statement of the Income and Expenditure connected

with the Brighton Exhibition, also a general Balance Sheet, December 31st, 1890.

With reference to the deficit on the working of the year 1889, shown in the last report, special donations were made by the members of Council and Officers amounting to £476 15s., and this, with a reduction made in the cost of the Transactions, has almost covered the deficit. The year's working for 1890 shows a profit balance of £234 6s. 11d.

The Council consider that this satisfactory improvement in its financial position is an evidence of the increasing utility of the work, and the status of the Institute.

DOUGLAS GALTON, K.C.B.,

Chairman of Council.

E. WHITE WALLIS, *Secretary.*

11*th March*, 1891.

STATEMENT of INCOME and EXPENDITURE, for the Year ended 31st December, 1890.

Dr.

Expenditure.	£	s.	d.	£.	s.	d.
To Transactions, Cost of Printing, &c., less Sales and Advertisements—estimated	146	11	5			
„ Sessional Meetings	11	2	6			
„ Lectures, Sanitary Officers	19	2	6			
„ Domestic Hygiene	32	13	10			
„ Examinations	602	12	0			
„ Congress, Brighton	159	13	1			
				971	15	4
„ Rent, Rates, Taxes and Insurance	244	3	5			
„ Salaries and Wages	520	7	0			
„ Coals and Care of Offices	31	14	8			
„ Repairs and Alterations	13	7	3			
„ Arrangement of Museum	4	7	10			
„ Library, Cataloguing, and Binding	13	3	2			
„ Postage and Carriage	66	7	5			
„ Printing and Stationery	85	2	1			
„ Advertising	2	15	5			
„ Incidental Expenses	38	11	5			
„ Alfred Lass & Co., Auditing Accounts	10	10	0			
„ Depreciation of Leasehold	52	0	0			
				1082	9	8
				2054	5	0
„ Balance for the year 1890				234	6	11
				£2288	11	11

Cr.

Income.	£	s.	d.	£	s.	d.	£	s.	d.
By Annual Subscriptions				595	8	0			
„ Entrance Fees				76	13	0			
„ Life Compositions				31	10	0			
„ Fellowship Fees				99	5	0			
„ Donations				2	2	0			
							804	18	0
„ Museum Admissions				2	1	0			
„ Lectures, Sanitary Officers				93	2	6			
„ Domestic Hygiene				39	1	0			
„ Examinations				765	14	7			
„ Congress, Brighton				47	9	2			
„ Exhibition, Brighton—Balance				534	14	3			
„ Publications — Farr's and Simon's— Profit on Sales				1	11	5			
							1483	13	11
							£2288	11	11

To Balance of Assets over Liabilities carried forward			2019	14	5	By Balance brought from last Account, —Surplus 1888	1808 6 8
						„ *less* deficiency 1889	602 3 2
							1206 3 6
						„ Donations on account of 1889 deficiency	476 15 0
						„ Transactions Reduction on Cost of Printing 1889 Volume	102 9 0
							579 4 0
						„ Balance on Year 1890	234 6 11
		£	2019	14	5		2019 14 5

Examined and approved,

ALFRED LASS & CO., Chartered Accountants,
MAGNUS OHREN, Assoc.M.Inst.C.E., } *Auditors.*

6th March, 1891.

STATEMENT OF INCOME AND EXPENDITURE connected with Exhibition at Brighton, 1890.

Dr.

Expenditure.	£.	s.	d.
To Printing and Advertising	241	11	9
„ Catalogues and Programmes	102	5	6
„ Bands and Entertainments	235	13	2
„ Lectures	25	14	0
„ Curator's Salary and Expenses	202	11	6
„ Wages	172	15	8
„ Incidental Expenses	154	9	11
„ Judging Expenses (Partly Estimated)	108	18	4
„ Proceeds of Evening devoted to Hospital Fête	35	15	6
	1279	15	4
„ Balance	534	14	3
	£1814	9	7

Cr.

Income.	£	s.	d.
By Rent for Space	835	16	9
„ Admission	798	8	1
„ Catalogues and Programmes	165	10	9
„ Fees for Further Trials	14	14	0
	£1814	9	7

Examined and approved,

ALFRED LASS & Co., Chartered Accountants,
MAGNUS OHREN, Assoc.M.Inst.C.E., } *Auditors.*

6th March, 1891.

GENERAL BALANCE SHEET, 31st DECEMBER, 1890.

Liabilities.	£	s.	d.
To Subscriptions paid in advance for 1891	30	19	6
„ Sundry Creditors	403	4	4
Balance of Assets over Liabilities.	2019	14	5
	£2453	18	3

Assets.	£	s.	d.	£	s.	d
By Lease of Premises, 10 years unexpired				494	3	8
„ Library and Contents of Museum, estimated value				500	0	0
„ Furniture and Fixtures, estimated value				100	0	0
„ Transactions and Publications, estimated value	484	14	6			
„ Farr's Works, estimated value	39	15	0			
„ Simon's „ „	102	10	0			
				626	19	6
, Sundry Debtors—						
„ Members' Subscriptions and Arrears ...	83	9	6			
„ „ from old Societies	17	17	0			
„ Fellowship Fees	10	10	0			
„ Entrance Fees	26	5	0			
„ Exhibition Account	3	0	0			
„ Donation promised.....	10	10	0			
				151	11	6
„ Cash at Bankers				581	3	7
				£2453	18	3

Examined and approved,

ALFRED LASS & Co., Chartered Accountants,
MAGNUS OHREN, Assoc.M.Inst.C.E., } *Auditors.*

6th March, 1891.

MODEL DWELLINGS IN LONDON, AND OVERCROWDING ON SPACE.

By Louis Parkes, M.D.Lond.

Read at a Sessional Meeting, February 11th, 1891.

Every year in London, a larger number of people are being housed in blocks of Model Dwellings. Twenty years or so ago the number of such dwellings was comparatively small, but now —owing to the demolitions which have been, and still are being, carried out in the more central and crowded districts of the metropolis, and to the necessity imposed by Parliament upon the local authorities, railway and other public companies, to re-house a portion of the working classes displaced—model dwellings have sprung up, and are still being erected, at a rate which means that before very long a considerable proportion of the industrial classes will be housed in this kind of tenement. At the present time about 20,000 people are now housed in the buildings of the Peabody Trust, and about 30,000 in the buildings of the Improved Industrial Dwellings Company. These are two of the largest associations owning buildings in London, but there are many other blocks of model dwellings belonging to other companies and private individuals.

The crowding on space which these lofty blocks entails is at once understood when it is stated that in such dwellings in London the number of inhabitants per acre averages 1200, or nearly 30 times the number per acre for the metropolis as a whole. Dr. Farr, many years ago, pointed out the relationship which existed between density of population and a high death-rate. We now know that such a relationship is not invariable, and the statistics of certain of the large companies and

charitable trusts owning numerous blocks of Artizan Dwellings in London, show that a certain amount of crowding on space is permissible if the dwellings are well designed, well constructed, and well ventilated, and that a fair standard of health is maintained under such circumstances. The statistics, showing a very low death-rate, published by some of the companies can, however, only be accepted with a certain amount of reserve, as corrections are by no means generally made for an age-distribution of the population of the dwellings which is favourable to a low death-rate, and the numbers of the inmates who die away from their homes in hospitals and infirmaries is not always included. The favourable age-distribution is shown by the high birth-rate prevailing in the dwellings, which indicates a population consisting largely of adults of less than middle age, with their families of children. Thus in the Peabody Buildings the birth-rate for 1889 was 39 per 1000, which is 8·7 per 1000 above that of all London for the same period. The death-rate was 16·49 per 1000, which is 0·96 per 1000 below the average of London. This death-rate is inclusive of deaths in hospitals, which constituted 14 per cent. of the total deaths. The Improved Industrial Dwellings Company, for the year ending June 30th, 1889, show a death-rate of only 11. per 1000, which is 6·6 per 1000 below that of London, and a birth-rate of 35·2 (4·5 per 1000 above London generally), but the death-rate is apparently not corrected for deaths in hospitals. In these dwellings the correction for hospital deaths would probably raise the death-rate from 11 to 13 per 1000, and the correction for age-distribution would probably necessitate the addition of another 3 per 1000, raising the death-rate to 16 per 1000, when comparison may justly be made with London generally or other urban populations.

In return for the closer aggregation which the inmates of model dwellings are subjected to, they get generally a superior accommodation in rooms, in sanitary conveniences, in facilities for washing their bodies and clothes, in freedom from street noises, and in enclosed courtyards where the children can play free from the dangers of crowded streets. Whilst many very satisfactory blocks of model dwellings have been erected by such bodies as the Improved Industrial Dwellings Company, the Peabody Donation Fund, the Commissioners of Sewers, some of the Railway Companies, &c., there are still a considerable number now existing which are models only of what is bad in design and undesirable in arrangement.

In this paper it will be necessary to restrict myself to one aspect only of the subject, namely, the outside air space and ventilation of the blocks, as bearing most directly on the

question of overcrowding on space. I examined recently some parallel rows of blocks of model dwellings in Shoreditch. The buildings are five storeys in height, and front upon streets only nineteen feet wide. Between the backs of the blocks is a courtyard only 12 feet in width. The rooms on the two lower floors of these dwellings, which are let as separate tenements, are nearly dark even at mid-day in winter, and are entirely cut off from any wholesome current of air. These dwellings are by no means isolated specimens, and instances might be multiplied from all over the metropolis of lofty blocks placed close together, and surrounding on all sides scanty courtyards, which constitute immensely tall and narrow shafts or wells from which the inner rooms of the blocks derive all their light and air. In many cases that I have seen I have had no hesitation in condemning these tenements as unfit for human habitation by reason of want of light and air. The reason for this crowding of lofty buildings on inadequate sites is, of course, that the cleared land in the more central parts of London is so valuable, that unless a very large number of persons are housed on the site, the owner does not realise the profits he thinks himself entitled to.

As it is now generally conceded that back-to-back houses without through ventilation, and rooms facing narrow enclosed courts in which the atmosphere is always sunless and stagnant, exercise an unfavourable influence on health, and tend to produce an excessive mortality from phthisis, respiratory diseases, diarrhœa, and zymotic diseases generally, it will not be necessary for me to detain you on this subject, which has been very carefully investigated for the Local Government Board by Dr. Barry and Mr. Gordon Smith, in a report upon Back-to-Back Houses (1888), and by Dr. Ransome, F.R.S., in various papers on the relationship between phthisis prevalence and overcrowding in Manchester and Salford.

It becomes now necessary to inquire if the sanitary Acts applicable to the metropolis were, or are, capable of preventing this evil, which is an increasing one, and one threatening gravely the future public health of this city. It is also one with which the public generally is not yet acquainted, as the erection of model dwellings for the working classes is popularly supposed to provide the proper remedy for the unhealthy areas and dilapidated houses included in schemes of clearance.

Prior to the year 1855 there was nothing to prevent houses being built back-to-back, *i.e.*, without any intervening open space whatever. In 1855, the Metropolitan Building Act came into force, Section 29 of which enacts that every new building to be used as a dwelling-house must have in the rear, or on the

side of it, an open space exclusively belonging to it of the extent of at least 100 square feet, unless all the rooms can be lighted and ventilated from a street or alley adjoining. That is to say, a mere open space, 10 ft. by 10 ft. it might be, no matter what the height or width of the building, whilst the corner houses of streets whose rooms can be lighted from two aspects, need not have any open space at the rear at all. The extent of open space here insisted on is of course ludicrously insufficient, yet this clause was the only one in force relating to the air space of dwellings until 1862, when an amending Act was passed containing a clause (Section 85), which enacted that no building was to be erected on the side of any new street of a less width than 50 feet, which exceeded in height the distance across the street from house to house, unless the consent in writing of the Metropolitan Board of Works was obtained. Here, then, at last is a recognition of the principle that the height of a building must have some relation to the amount of open space in front of it; but at the same time nothing was done in this Act to increase the amount of open space to be compulsorily left in the rear of a building, and the clause itself only applies to streets newly laid out.

Matters remained thus until the year 1882 (twenty years later). when it came to be recognised that perhaps it would be as well for the open space in the rear of houses to have some relation to their width (not their height), and it was enacted in another amending Act (Section 14) that every new building to be used as a dwelling-house and erected upon a site not previously occupied by a building, shall have, unless the Metropolitan Board of Works otherwise permit, directly attached to the rear of it an open space exclusively belonging to it of the following extent.

Frontage of building—

Not exceeding	15 ft.,	open space	shall be	150	sq. ft.	at	least.
„	20 „	„	„	200	„	„	
„	30 „	„	„	300	„	„	
Exceeding	30 „	„	„	450	„	„	

It was also enacted that this open space shall be free from any erection thereon above the level of the ceiling of the ground floor storey, and shall extend throughout the entire width of each building at the rear of it.

This clause, then, enforces open space in the rear of houses built on ground not formerly built on before 1882, according to the amount of frontage width of the building, but specifies nothing in relation to the height of the building. At the present day in London, a builder who had bought land

cleared of buildings erected before 1882, could build blocks of model dwellings of any height up to 90 ft.,* provided the street was laid out before 1862, and could then build parallel blocks behind them of any height up to 90 ft. and separated from the first blocks by a number of wells 20 ft. by 10 ft. at the bottom, the front and back blocks being attached to each other back-to-back, except where the wells intervened, there being necessarily one well for each set of tenements divided from its neighbours by party walls (Metropolitan Building Act, 1855, Sect. 27). Not only would there be nothing to prevent a builder perpetrating such a building enormity as this, but the wells of 200 square feet could be covered by sheds extending as high as the ceiling of the ground floor storey.

We have, then, considerable reason to be grateful, that greater advantage has not been taken of the absence of any sufficient requirements in London for open space around dwellings, by the private individuals and companies who have undertaken the erection of Artizans' Dwellings. A great many faulty dwellings and blocks, obstructive of air and light, do exist, but matters might very well, in the absence of all reasonable restrictions, have been very much worse. It may be as well perhaps to consider the reasons why many industrial dwellings are not worse off for light and air than we know they actually are. In the first place, there is a limit beyond which the people who are to inhabit the model blocks will not permit themselves to go, even in their desire to be near their work. It is well known that the working classes themselves are averse to living in what they consider barracks, if they can get equally good accommodation in ordinary dwelling houses close at hand. The rules and regulations of the model dwellings are not always to their liking, and if in addition they find that artificial light has to be used by day all through the winter months they will not on any consideration become tenants of such rooms. Consequently a builder would make a financial mistake, who should construct a large number of tenements which he could not sell or let at any price. At present the people have a considerable choice of where they shall live ; but it must not be forgotten, that with the increasing demolition of small insanitary house property, which will surely result from the operation of the new Housing of the Working Classes Act of 1890, under the direction of the London County Council and the Vestries, and from the immense extension of business premises in the

* By the London Council (General Powers) Act, 1890, Section 36, the height of buildings exclusive of roofs and turrets must not exceed 90 ft.

more central districts, a time will come when many of those who must live near their work will have no option except to become tenants of the model dwellings, and many will perforce be compelled to occupy the tenements which they now regard with so much aversion.

In the second place, although the sanitary authorities have no power to control the faulty building in course of erection, they can, as soon as the tenements are occupied, take steps to have them closed as unfit for human habitation, should the Medical Officer of Health consider the absence of light and air a sufficient reason for the case to be taken before a magistrate; and the fear of this being done must have operated in many a case where the owner was not influenced by any higher consideration than his own profit in the erection of dwellings.

Thirdly, a considerable proportion of the model dwellings in London have been erected by charitable Trusts, and by Companies presided over by men of eminence in the philanthropic world, whose desire has been to provide good accommodation, and to ensure no larger dividends than four or five per cent. on the outlay. The dwellings, also, now provided by the railway companies for people displaced to carry out their extensions or improvements, have to be surveyed and the plans passed by an official appointed by the Home Secretary, whose business it is to see that overcrowding on space is not carried to any great extent.

Still, notwithstanding these considerations, as has already been stated, many model buildings now exist, providing tenements absolutely unfit for human habitation by reason of want of light and air, and there is nothing to prevent the continued erection of such buildings, and their even closer crowding as land becomes year by year more and more valuable.

The operation of the Housing of the Working Classes Act is likely to increase and perpetuate the evil in this way, viz., that houses closed and subsequently demolished by the action of the Vestry alone, will very likely be replaced on the old site or sites by model dwellings of a bad kind; for Section 34 of Part II. of the Act is too vague in its terms to be of much use to prevent the erection of such structures. The section reads:—"Where a building has been so taken down and removed, no house or other building or erection which will be dangerous or injurious to health shall be erected on all or any part of the site of such building; and if any house, building, or erection is erected contrary to the provisions of this section. the local authority may at any time order the owner thereof to abate the same, and in the event of non-compliance with

the order, may at the expense of the owner abate or alter the same." Of course if the owner demolishes of his own accord, without waiting for the Vestry's order, this section does not apply at all.

With regard to the unhealthy areas cleared by the action of the London County Council and compulsorily acquired, there is no reason to fear that the evils got rid of will be replaced by others, for which they are intended to provide a remedy. The County Council, in the case of the Boundary Street area in Bethnal Green, will only sell the land under certain conditions. These conditions are that the blocks of dwellings to be erected shall not exceed 40 ft. in height (four storeys), and that parallel blocks shall be separated from each other by an open space clear from the ground of at least 40 ft. in width (the height of the buildings). The new streets will be forty feet in width, and the blocks will run almost due north and south, so as to admit the maximum amount of light to all the tenements equally; also the courtyards between the blocks will be left entirely open at each end, unobstructed by any cross buildings. Of course the land sold under these conditions cannot fetch anything like the price which would accrue if sold free from restrictions. Hence the cost of the scheme to the ratepayers. A precedent having been created in this respect by the present London County Council, we may well hope that future Councils will not depart from it. It is far better in every way that the present generation should provide the proper remedy for the evils in housing which it finds to exist, and not leave a further legacy of sanitary neglect to future generations, which they may well find even more difficult to cope with than the present population does those handed down by its predecessors.

In 1885 the Royal Commission on the Housing of the Working Classes had under consideration the statutory provisions in force in the metropolis with regard to the height of buildings and the space about buildings for the purpose of securing a free circulation of air. The Commission recommended (1) That upon the lines of the existing enactments in the Acts of 1862 and 1878, rules of more general application be framed to control the height of buildings in relation to the open space which should be required to be provided in front of the buildings, either in the form of land exclusively belonging to each building and kept free from erections, or in the form of an adjoining street. (2) That in the rear of every new dwelling house or other building, and whether in old or in new streets, there be provided a proportionate extent of space exclusively belonging to the dwelling house or building; that this space be

free from erections from the ground level upwards; that it extend laterally throughout the entire width of the dwelling house or building; that for the distance across the space from the building to the boundary of adjoining premises a minimum be prescribed; and that this minimum increase with the height of the dwelling house or building.

Thus six years ago the Royal Commission well and concisely summarised the pressing requirements for securing adequate open spaces to houses in London; but since then nothing has been done. Neither the old Metropolitan Board of Works nor the new County Council ever had, or now have, the power to frame bye-laws for the open spaces about new houses, which was conferred upon all Urban Sanitary Authorities outside London, sixteen years ago by the Public Health Act of 1875 (Sect. 157). By the Metropolis Management Act Amendment Act, 1878, the Metropolitan Board of Works was given power to make bye-laws for the foundations, sites, and materials of new houses, so as to secure stability, prevention of fires, and for purposes of health, but the amount of open space around houses was not included; and this, be it remembered, three years after the passing of the Public Health Act, which expressly gave such powers outside London.

Why should London have been so long neglected in this way? Surely, with its immense population and enormous area, it ought to have as much air space around its houses as provincial towns. The air of London generally is not so pure that we can put up with a very small amount of it, on the principle that quality makes up for quantity. The necessity for sufficient air space has been recognized for fifteen years by the Legislature, but London is allowed to drift on in the old manner. The land, perhaps, is more valuable in London than in most provincial towns, but if reasonable restrictions on the rights of property are necessary in provincial towns to safeguard the health of their populations, they are surely equally desirable in the interest of public health in the metropolis.

An opportunity will be afforded this year, let us hope, of rectifying the disability so long cast upon the metropolis. In the Public Health Act for London, which is to consolidate and amend all existing metropolitan sanitary legislation, a clause should be inserted giving the County Council power to frame and enforce bye-laws for all new buildings, "with respect to the sufficiency of the space about buildings to secure a free circulation of air, and with respect to the ventilation of buildings." The bye-laws, when made, would have to be confirmed by the Secretary of State, and then London would stand

very much on the same footing as regards its new buildings, as the hitherto more fortunate provincial towns.

The accompanying table shows the bye-laws* for open space around new domestic buildings now in force in five cities (Manchester, Brighton, Birmingham, Liverpool, and Newcastle), which have probably done more than any other towns in this country in clearing unhealthy areas, and providing for the erection of improved dwellings for the industrial classes, Glasgow excluded, but Glasgow has not at present any bye-laws bearing on this question. It will be seen that the bye-laws of Brighton and Manchester are founded very closely upon the model bye-laws of the Local Government Board, but those of Brighton actually require more open space than is suggested by the Local Government Board as desirable. The Birmingham bye-laws are similar, but there is the very important limitation of the regulations to houses the net rateable annual value of which will not exceed £20. Consequently, model dwellings will be excluded from the application of the bye-laws, as the rateable annual value of a block of tenements included between two party walls would far exceed the £20 limit. There is also a clause in the Birmingham bye-laws which the Local Government Board very rightly objects to on principle, namely, the discretionary power on the part of the Town Council to modify the application of the bye-laws in particular instances, thereby introducing an element of uncertainty prejudicial to the carrying out of the regulations, and exposing the Town Council to charges of unfairness in its dealings with individuals. It should also be noted that a possible considerable sacrifice of property is made a reason for not enforcing the regulations. These limitations are contained in the older Bye-laws of 1876, and are not in those of 1887, and it is very probable that the Local Government Board refused to sanction them when re-introduced into the new bye-laws for 1887; hence the retention of these clauses in the form of an appendix to the new bye-laws.

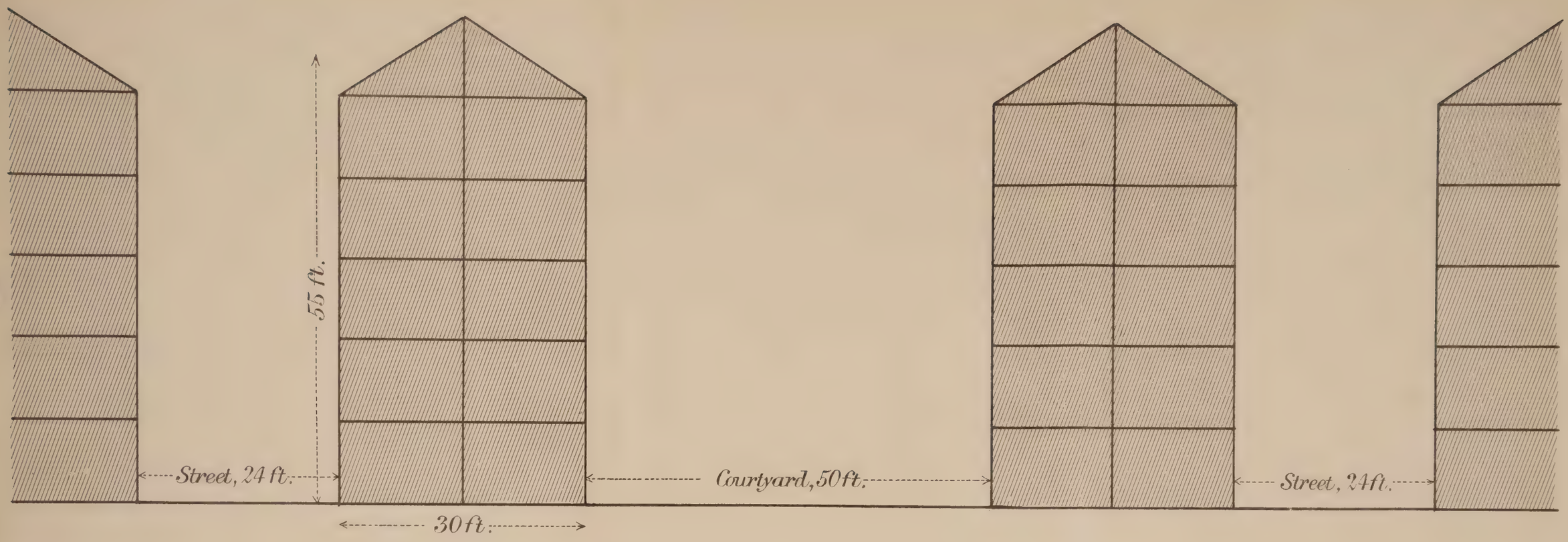
The Liverpool bye-laws provide for a less open space in the rear of new domestic buildings, and exclusively belonging to them, than is sanctioned by the Local Government Board, and allows nine feet of the prescribed minimum width to be taken into account from an adjoining street. In certain cases also the open space may be at the side, and not in the rear of the house. In most bye-laws the height of the house is to be measured from the ground level to the level of half the vertical

* Copies were kindly sent me by the Medical Officers of Health of Manchester, Brighton, Newcastle, Glasgow, and Birmingham, and by the City Engineer of Liverpool.

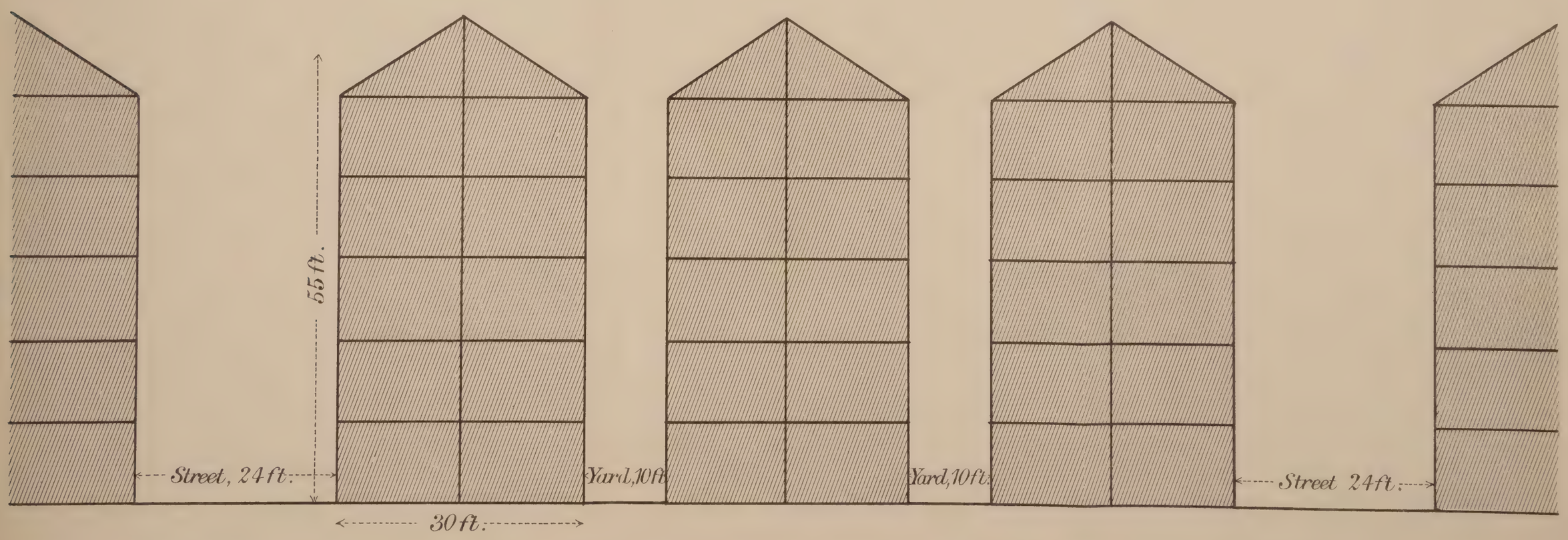
Bye-laws for Open Spaces around new Dwelling-houses.

	Date of Adoption.	Acts under which Bye-laws are framed.	*Open Space in Front*, extending throughout whole line of frontage, to be at least.	*Open Space at Rear of Building*, exclusively belonging to it, and free from any erection above the level of the ground, except a W.C., E.C. or a privy and ashpit, extending laterally throughout entire width of building.						*Limitations.*
				Aggregate Extent not less than	*Distance across or depth of open space everywhere to be according to height of building.*					
					In any case.	Height 15 ft.	Height 25 ft.	Height 35 ft.	Height exceeding 35 ft.	
Model Bye-laws of Local Government Board.		Public Health Act 1875, Section 157.	24 ft.	150 sq. ft.	At least 10 ft.	At least 15 ft.	At least 20 ft.	At least 25 ft.	At least 25 ft.	
Manchester.	1890	Local (Manchester) Improvement Acts.	36 ft. [24 ft. if street is less than 36 ft. wide].	150 sq. ft.	10 ft.	15 ft.	20 ft.	25 ft.	25 ft.	
Brighton.	1886	Public Health Act; Towns Improvement Clauses Act, 1847; Brighton Improvement Act, 1884.	12 ft. to centre of street, if street laid out before Local Government Acts. 15 ft. to centre, if street laid out before 1886. 18 ft. to centre, if laid out after 1886.	200 sq. ft.	10 ft.	15 ft. (300 sq. ft. aggregate extent.)	20 ft. (400 sq. ft.)	25 ft. (500 sq. ft.)	25 ft. (500 sq. ft.)	
Birmingham.	1876* 1887†	Public Health Act; Local (Birmingham) Consolidation Act, 1883.	24 ft.†	150 sq. ft.*	10 ft.*	*2 storeys.* 15 ft.*	*3 storeys.* 20 ft.*	*More than 3 storeys.* 25 ft.*		* These regulations only apply to houses, the net rateable annual value of which will not exceed £20; and when thorough ventilation of such open is secured, or when on the re-erection of buildings within the Borough, these dimensions cannot be adhered to without considerable sacrifice of property, they may be modified in special cases at the discretion of the Town Council.
Liverpool.	1890	Public Health Act.	30 ft. [12 ft. 6 in. from centre of street, if street is less than 25 ft. wide, and was laid out before 1890].	150 sq. ft.	5 ft. [Open space must be equal in depth to the height of the back wall of the house, but this may include 9 ft. of the adjoining street.]	*Height of wall between 20 and 30 ft.* 10 ft.	*Height of wall exceeding 30 ft.* 15 ft.			The open space may be at the side of the house, and not in the rear, when the back of the house has a window in each storey, opening to a street not less than 9 ft. wide. Unless the open space at the rear is of an aggregate extent of 500 square feet, it must on three sides adjoin an open space of another dwelling-house, or adjoin a street.
Newcastle-upon-Tyne.	1866 1870 1871	Bye-laws, 1866; Newcastle Improvement Acts, 1870, 1871.		One-fourth the area of ground belonging to building: may be at the side instead of the rear, applies to corner houses.						These regulations do not apply to new dwelling-houses erected on a site previously occupied by a dwelling-house, unless the former house had an equal or greater extent of open space at the side or rear. Where the open space was less in extent than that required by the regulation, then the open space for the new house must not be less than that which previously existed. In the case of dwelling-houses built prior to 1871, and having open spaces not greater than that required by the regulation, these open spaces are never to be built upon, except with the approval of the corporation.

A

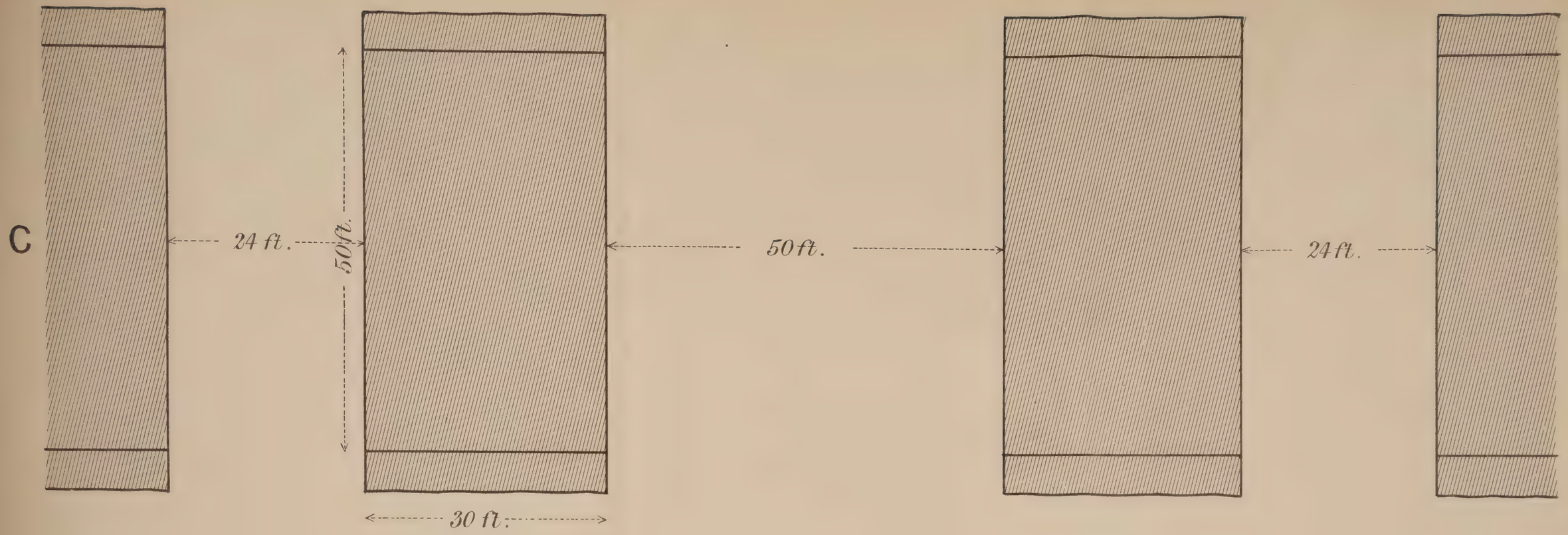


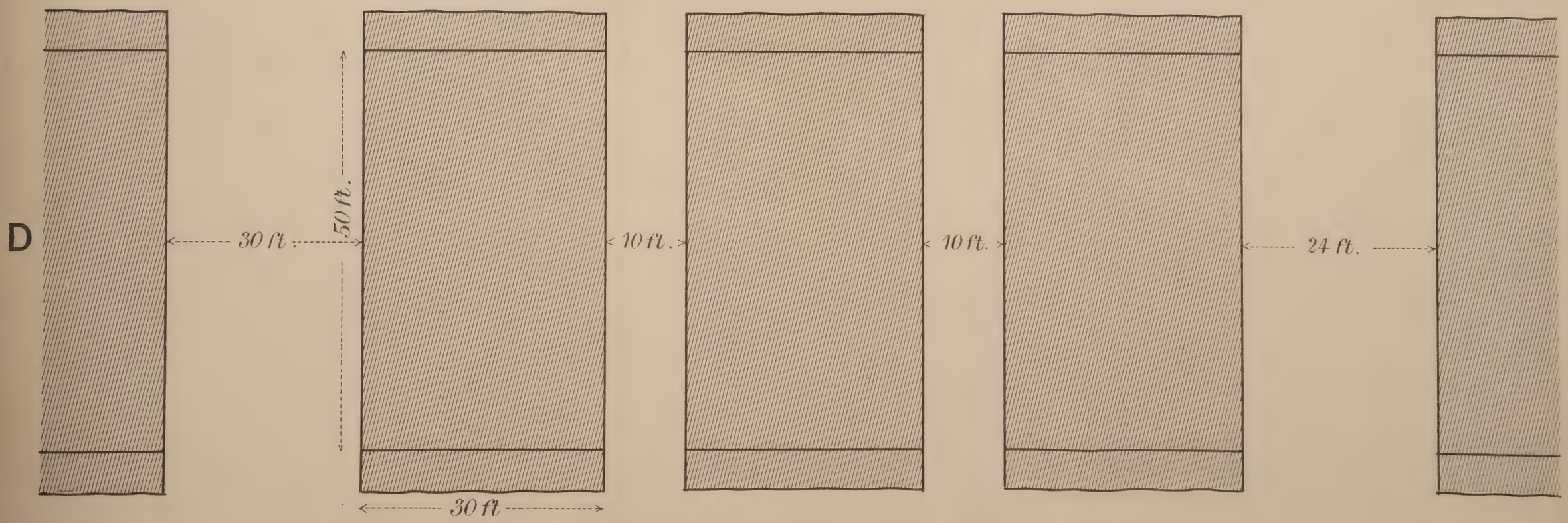
B



A *Elevation of Model Dwellings, showing minimum open space required for new domestic buildings under Model Byelaws*

B *Elevation of Model Dwellings, showing possible arrangement in London.*





C *Plan of Model Dwellings under Byelaws.*
D *Plan of Model Dwellings in London.*

height of the roof, or to the top of the parapet, whichever is the higher; but in Liverpool the height of the back wall from the ground to the eaves of the roof need only be taken into account. It is preferable to measure the open space in front of the house to the centre of the street, as is done in Brighton and Liverpool; otherwise the sacrifice of land falls only upon the owner, who rebuilds first on one side of a street of less width than twenty-four feet, and the owner of the opposite houses retains his original line of frontage when his turn comes to rebuild.

The Newcastle-upon-Tyne Bye-laws are very deficient, as there is no regulation for a minimum open space in front of a house, nor for the depth of open space in the rear according to the height of the building. The limitations also practically restrict the amount of open space to be left in the rear of new dwellings upon old sites to what existed prior to the passing of the Acts, and the regulation for preventing the building over open spaces in the rear of old buildings is bad in law if included in bye-laws for new buildings, as such regulations are *ultra vires* when included in such bye-laws, as the case of Tucker *v.* Rees shows.

The diagrams A, B, C, D, are intended to show (A and C) the minimum amounts of open space in front and rear of new model dwellings allowed by the model bye-laws of the Local Government Board, such as have been adopted in Brighton and Manchester, whilst in London the possible arrangement of such buildings on the same amount of space is shown (B and D). Each block is 30 feet deep, has a frontage of 50 feet, and is five storeys in height—the height of the building measured from the ground to half the vertical height of the roof is 55 feet. Each block might have four sets of tenements of two rooms each on each floor—two tenements in front and two at the back of the block; allowing for a family of four in each tenement, this would give the population of each block as 80, or in the two blocks 160, or in three blocks 240. In the two blocks erected on such a site in Brighton or Manchester, the density of the population per acre would be 1040, whilst in London the three blocks would give a density of 1560 per acre —in each case half the area of the adjoining streets is included. In Brighton and Manchester 54 per cent. of the area included between the front walls of the opposite blocks would be covered by buildings, whilst in London 82 per cent. of the area would be covered by buildings. In the London blocks 40 per cent. of the rooms would be so devoid of light and air as to be practically uninhabitable, that is to say, all the inner rooms facing the 10 feet wide shafts below the two upper storeys.

	Percentage of site covered by buildings.	Density per acre.	Percentage of uninhabitable rooms.
Brighton or Manchester	54	1040	0
London ...	82	1560	40

This diagram illustrates a defect in the requirements of the Model Bye-laws, viz., that whilst the open space at the rear of the new buildings must vary with the height of the buildings up to 35 feet, and can in no case be less than 50 feet wide for opposite buildings exceeding 35 feet in height, the minimum open space in front is fixed at 24 feet, and in streets so narrow as this there is no limitation of the height of the buildings. The tendency in large towns is to increase the loftiness of the buildings, and it is surely desirable that in all streets less than 40 or 50 feet in width, the height of new buildings should bear some proportion to the width of the street.

In this diagram the London model dwellings are supposed to be erected on the sides of streets laid out previously to 1862, and on sites formerly occupied in whole or in part by buildings, such for instance as constitute nine-tenths of the sites on which model dwellings have been, and are likely to be, erected for many years to come in the metropolis.

Dr. PARKES, at the conclusion of his paper, moved:—

"That this meeting, recognising the necessity for securing a greater amount of open space around new buildings in London, in the interests of public health of the metropolis, hereby recommends the Council of the Sanitary Institute to petition the President of the Local Government Board to insert in the Bill for amending and consolidating the Sanitary Acts in London, a clause empowering the London County Council to frame and enforce bye-laws for new buildings in London in respect of sufficiency of air space, to secure a free circulation of air about them, and the proper admission of light to the rooms."

Sir DOUGLAS GALTON, K.C.B. (London), in putting the resolution, observed that he thought the high rents asked in London arose in a considerable measure from the license allowed to property owners to crowd lofty buildings on a small space of ground.

Mr. R. M. BEACHCROFT (London), Vice-Chairman of the Housing of the Working Classes Committee of the London County Council, seconded the resolution, and suggested as an alternative that a petition might, if thought desirable, also be presented to the London County Council urging an amendment of the Building Acts. He

quite agreed with the mover that considerable objection was entertained among the working classes to barrack buildings, but thought the only practical remedy for overcrowding on space was the removal into the suburbs of a large proportion of the population from the congested districts, and the immediate provision, on a comprehensive scale, of satisfactory cottage accommodation under proper regulations in the outskirts of London.

Mr. Shirley Murphy (London), thought that the author of the paper had put forward very clearly what the wants of London really were, and he thought it would be very desirable if we could have in London the power of dealing with the question of air space about houses by bye-law. At present it is permitted, under certain conditions, to build houses without any space at their rear and without through ventilation. He could assure the meeting that the London County Council were not unmindful of the importance of the question of air space about houses, and in Mr. Ritchie we had a minister who had shown great interest in public health questions; he hoped, therefore, London would not continue long in the disadvantageous position it now occupied. The height of rooms was also a question that needed attention. With regard to the price of land in London, which had been referred to, he had been informed on good authority that with the exception of the city and special districts such as Charing Cross, it was not higher than in other large towns.

He ended by proposing a vote of thanks to Dr. Parkes for his paper.

Mr. Keith Young, F.R.I.B.A. (London), seconded the vote of thanks, and said that he considered that the height of buildings should be so proportioned to the width of the street, that the light could enter all the windows, at an angle of not less than 45 degrees. He pointed out that many of the larger blocks of model dwellings are to all intents and purposes back to back houses, which are so universally condemned. In some cases buildings were 60 feet high and separated by courts only 18 feet wide, and these courts were "culs-de-sac." The bye-laws made under the Building Act Amendment Act require, in all cases of new buildings, that the site, if not previously built upon, should be covered with concrete, but if a man pulls down an old house when the ground is contaminated by all sorts of accumulations, he can re-build it without being bound to protect the inhabitants by such an impervious stratum.

Dr. G. V. Poore (London), thought that the overcrowding on space was the most important of all sanitary questions. The cause of the overcrowding on space in large towns was, he said, water under pressure which enabled people to get water to the top of large buildings and also to wash away the refuse from the town. Huge blocks of buildings were being erected in all our towns, nobody interferes, and it is thought that the public health will not suffer. But it must be

perfectly evident that in all cases of air-borne infection, the putting of people on the top of each other and under one roof, must enormously increase the risk. Take for example the influenza in the beginning of 1890, which was essentially an air-borne disease. From a table of corrected death rates given in the *British Medical Journal* for May 10th 1890, for the first three months of 1890 it would be found that the death-rate for the whole of London was only slightly raised, while in the seven central districts of London, having a population of 270,000, it ranged from 26·7 to 38·8, and the total births in these districts during the three months was 2,012, and the deaths 2,153, showing that in this metroplis of ours during those three months the deaths, in the central districts, exceeded the births by 141. He then pointed out some of the evils likely to arise from cases of infectious diseases in the fashionable mansions or flats. He next alluded to the absence of light in London, which made it necessary to burn candles in the day-time, which was another evil caused by overcrowding on space, as these enormous buildings of mansions and flats largely increased the amount of smoke poured into the atmosphere within a given area. He believed that this question had a very considerable relation to social and labour questions. Most people, he said, were of opinion that there ought to be no underground dwellings, but, as a matter of fact, the servants of those who held such opinions were housed below the level of the street. What he thought should be the rule was that the curtilage of every house should bear a definite proportion to the cubic contents.

Mr. Percival Gordon Smith, F.R.I.B.A. (London), said that in London it was not impossible, under the present Acts, to build new back-to-back houses. The only provision on the subject is, that all rooms must be lighted and ventilated from a street or alley adjoining, and thus, if a common lodging house, for example, were built with rooms of excessive depth and lighted and ventilated from a street in front only, it could not be condemned, although it would be actually, or equivalent to, a back-to-back dwelling. As to the height of houses, he was very much amazed at the provisions of the Act of last year, as he could hardly understand it being necessary to place a limit on the height of buildings, while allowing anyone to erect them so high as 90 feet, with two storeys in the roof *in addition*.

Mr. Francis Hooper, A.R.I.B.A. (London), considered that the diagram exhibited amply illustrated the impotence of existing building legislation in London to secure curtilage around the lofty tenement buildings sufficient to ensure their enjoyment of a full complement of light and air. When houses are reconstructed in old streets, it is at present the habit to leave to adjacent private owners of property the vindication of prescriptive rights to light and air, and to ignore the public interest in these necessary commodities. Hence it follows that when private owners agree to pecuniary compensation for their losses, the public become the sole losers. Mr. Hooper contended that

the plans of buildings to be erected specially for the occupation of artisans in crowded districts should be submitted for the approval of some competent authority, such as would forbid the erection of buildings the like of which are a disgrace to the metropolis. It should be more generally recognised that abundant light and ventilation is as indispensable in staircases and approaches as in the actual living rooms of such thickly populated buildings, both for the moral and physical well-being of the tenants.

Mr. W. White, F.S.A. (London), thought that some definition was needed with regard to the amount of light and air. In Wakefield they have rules which limit the smallness of windows to the tenth part of floor area. In all habitable rooms windows must have half their area made to open, and they must open to at least 7 feet 6 inches from the floor. He thought that this point had not hitherto received the attention of those concerned in framing the Building Act. He thought that if the angle of 45 degrees for light were insisted upon, it would be most desirable. But he did not see how it would be possible. This alone would soon spread London into the country.

Mr. H. B. Collins, R.N. (London), said that the fittings of windows and doors, and smoky chimneys, in the large workmen's buildings were very much complained of, and he thought it strange that Architects could not build dwellings with chimneys that would not smoke.

Mr. D. Richards (London) thought it was a question whether the density of the population was better upwards or spread over the ground. In the matter of ventilation he thought, that in high blocks of buildings the open windows of the upper rooms would necessarily receive the impure air coming out of the lower windows, and he thought that smaller houses and narrower streets were better. Shorter hours of labour and a cheaper railway system were wanted to get the people into the country.

The resolution was then put by the Chairman and carried unanimously, and a vote of thanks to Dr. Parkes was also carried.

Dr. Louis Parkes (London), in acknowledging the vote of thanks, said he thought that the power to frame bye-laws, if entrusted to the London County Council, would meet the necessities of the case better than the insertion of clauses in amended Building Acts. The standard suggested by Mr. Keith Young, that all living rooms should receive light from the sky at an angle not greater than 45 degrees, was a valuable one, and was one to be striven for, even if it was necessary to be content with something less for the present. He did not think it was practicable to endeavour to abolish the occupation of

cellars and underground sleeping rooms, but something might now be done to increase the stringency of the clauses regulating the condition and construction of such dwellings. He agreed with Mr. Gordon Smith, that the present limit of the height of houses in the metropolis to 90 feet, with two storeys in the roof and excluding turrets and towers, was allowing far too great a height. The new block of buildings at Knightsbridge was an instance of the extensive overshadowing of neighbouring structures, produced by buildings of such enormous altitude. More or less lofty blocks of artisans' dwellings in large cities were a necessity of the times. That such buildings could be made into healthy houses for the working classes was evident from the experience of the Peabody Trust. What was required was, that suitable restrictions should be in force to prevent the too great aggregation of the blocks, and the excessive overcrowding on space with all its sanitary evils.

THE PREVENTION OF INFECTIOUS DISEASE,

By A. Wynter Blyth, Professor of Hygiene at the College of State Medicine.

Read at a Sessional Meeting, March 11th, 1891.

ABSTRACT.

The origin or cause of "communicable" disease is alike in animal and plant, the cause in each being minute life-forms preying upon larger and higher lives. These microscopic parasites are known by the general term of "micro-organisms," and include a vast number of genera and species. The great majority of micro-organisms which swarm in air, water, and soil, are not disease-producing, but others are, and it can be proved that a few, originally innocent, may, by being placed under certain conditions, in the course of a few generations produce a parasitic, malignant race, endangering the life of the animal which they attack. Since the origin of communicable disease is practically the same throughout the world of life, so the laws of communicability, and the methods of prevention, are in their essence ever the same.

Communicable human diseases cannot in the present state of science be classified as yet on a really scientific basis, but the following may serve the purpose for a time: 1, *Eruptive fevers*, *e.g.*, small-pox, measles, scarlet fever, typhus; 2, *Diseases affecting the Nervous system*, *e.g.*, rabies, tetanus, whooping cough; 3, *Diseases affecting the Organs of Respiration*, *e.g.*, pneumonia; 4, *Septicæmic maladies*, *e.g.*, septicæmia, erysipelas, diphtheria; 5, *Tubercular diseases;* 6, *Malaria;* 7, *Diseases affecting the Intestines*, *e.g.*, cholera, typhoid fever, diarrhœa, dysentery.

There are three ways by which communicable diseases can enter the system: the infective particles must be either breathed, swallowed, or inoculated. If infectious diseases were classified simply from the point of view of contagion, they might be arranged thus:—1, those which enter with the breath and

attack the lungs or the mucous surfaces of the throat and air passages: phthisis, small-pox, measles, typhus, whooping cough, diphtheria, malaria, pneumonia; 2, those that are swallowed: scarlet fever, pneumonia, cerebro-spinal meningitis, (cancer?) tuberculosis, cholera and diarrhœa, dysentery, leprosy; 3, diseases inoculated: rabies, tetanus or lock-jaw, erysipelas, anthrax, tubercle, cancer, syphilis, leprosy.

It will at once be noted that some of the maladies appear in more than one group. For instance, tubercle may be acquired by sucking it in with the breath, by taking it into the stomach in tuberculous meat or milk, and by inoculation. Nor is this a mere idea, it is founded upon experiment; Koch has produced a tuberculosis of the guinea pig by causing it to breath dust impregnated by tubercle. In a similar way it has been proved that milk drawn from the tuberculous udder of a diseased cow is likely to produce tuberculosis. And lastly, tubercle inoculated under the skin of almost any animal promptly shows its effects.

In these experiments it has also been shown that, as a rule, when tubercle-contaminated dust is breathed the disease primarily affects the lung; when tuberculous matters are swallowed the first beginnings of the malady are to be found in the intestines, or the membrane covering them (Tabes mesenterica); and when the infectious matter is inoculated the tubercle is generalised. Hence from these experiments we obtain important information as to the way in which a person has probably been infected, if the seat of the beginning of the disease is ascertained at a sufficiently early stage.

I have also put pneumonia under two headings, believing that it may be acquired by the breath, and also by taking food which is in some way specifically infected. That the infectious pneumonia is communicable by food may be suspected, by the experimental fact that mice fed on bread contaminated with pneumonic sputum become affected with pneumonia. I have also seen a limited and extraordinarily fatal outbreak of pneumonia sweep away almost all the members of a family, and had good evidence to suspect contamination of their food.

It ought, on theoretical grounds, to be easiest to prevent the class of diseases which are conveyed by inoculation; next, those which are most commonly swallowed, such as cholera and typhoid; and lastly, most difficult of all to prevent, those in which (*e.g.*, typhus) the disease we may presume is inhaled.

The records of epidemics do not, however, lend much support to this theory, possibly because until quite recently no preventive measures have been taken on these lines. For example, if we hold that phthisis is mostly inhaled, tabes swallowed, it ought to be far easier to prevent tabes than phthisis. The

records of mortality of phthisis and tabes for three decades are as follows :—

	1851—60.	61—70.	71—80.
Phthisis ...	1305 ...	968 ...	767
Tabes ...	1920 ...	2267 ...	2250

That is to say, in the first ten years the deaths from tabes are a little more than 1·6 times those of phthisis; in the next ten years the proportion had increased to more than twice: and in the ten years ending 1880 they were more than three times the deaths from phthisis.

What is the meaning of this increasing disproportion? Is it from the feeding of the young on tuberculous milk or meat? From the one or the other, or both? Or is it again from the general advance in the art of diagnosis, tubercle in the bowels being more frequently detected than formerly? No answer can be given to these questions, but what we can affirm is that tubercle in all its forms is communicable; and the time has therefore come for measures of isolation and prevention to be taken in all those cases in which there is a fair possibility of danger to the healthy.

It is now a well-ascertained fact that certain fatal and infectious diseases produced by micro-organisms can only be propagated in certain animals, the one class of animals being "susceptible," the others "immune." So again, it is known that a person having had scarlet fever once is to a considerable extent protected from a second attack. Previous to the first attack he was "susceptible," after the attack he has become "immune." Thus immunity may be natural, hereditary, or acquired. Mice and rats are naturally immune against diphtheria, frogs are naturally immune against tuberculosis. Immunity against small-pox may be artificially acquired by a previous attack or by vaccination; immunity against rabies may be also obtained by a similar process. Careful experiments are being made with the object of ascertaining whether the blood, or some substance separable from the blood, of animals which are either naturally or artificially immune, may be used as an agent to confer immunity, or even work as a curative agent, and much is in the future to be hoped from this channel of experiment. There is likewise some evidence that certain definite chemical compounds—like quinine, trichloride of iodine, and corrosive sublimate—may confer a temporary or complete immunity against a few zymotic diseases. Quinine has long been used as a preventive of malaria, and used with a fair amount of success.

1. Hence one of the methods of preventing the zymotic class of diseases is by scientific means to obtain "immunity."

2. Pure air, free from dust and suspended matters and the contaminations caused by overcrowding; light is also good. Sunlight is fatal to some of the disease-producing organisms.

3. Pure or uncontaminated water; water being largely concerned in the spread of typhoid fever.

4. Pure, sound, healthy food. The meat supply of the present day is practically uninspected, and a large amount of diseased meat is consumed. Important under this heading is the preservation of food, and sterilising of food, such as the storing of food in proper and suitable places, thorough cooking, and the boiling of all milk.

5. Lastly must be mentioned "the prevention of spread"; and communicable diseases are prevented from spreading by—firstly, isolation; and secondly, the proper use of disinfecting substances. This proper use differs according to the main channels of infection, which are not in all diseases the same. In cholera, diarrhœa, and typhoid, the discharges from the bowels are most dangerous; in typhus, the volatile emanations from the skin; in phthisis, the matter coughed up; in septicæmia, the fluids of the body generally, and so on.

The above short summary amply shows that much infectious disease can be prevented by cleanliness in food and habit, and by simple common sense precautions, possible in most households.

The Chairman, Sir Douglas Galton (London), said physicians say that all diseases are due to attacks of microbes, which surround us in innumerable quantities; but, fortunately, the body when in a healthy state is able to repel their attacks; if it were not so we could not live on the face of the earth. However facts may be with regard to recent investigations in diseases, they have not shaken the broad principles of sanitation, namely, that our surroundings should be as healthy as possible.

Mr. T. W. Maule (London) asked whether the microbes in Thames water are destroyed by the filters of the water companies; and whether the storage of water in cisterns is likely to contaminate the water.

Mr. F. R. Dockay (Croydon) said the boiling of milk was frequently suggested as a precaution against disease, but what could be done with cream, which, of course, could not be so treated?

Mr. H. B. Collins (London) said in some old buildings inhabited by the working classes he had three cases of pneumonia in one family following one upon another, two recovered but the last died.

Since these old buildings had been pulled down, scarlet fever had decreased, and he did not remember a single case in any of the new buildings; all the infectious diseases were much more rare than formerly.

Mr. J. Young (London) asked if all cases of typhus reported under the Infectious Diseases Act were accepted as such.

Sir Douglas Galton (London) asked whether in lofty blocks of artizans' dwellings children's sickness is greater than in the dwellings formerly occupied by this class.

Mr. Collins said that it was not so in his experience, the general sickness among the children being much less in the model lodgings.

Dr. P. W. G. Nunn (Bournemouth) thought that the causation of diphtheria was a question that required consideration. The disease may be caught from the breath of others, but it is frequently taken in other ways, and is more probably due to bad air from the sewers. At a house where some alterations were being made the workmen broke into the old soil-pipe on a Saturday and left it open until Monday, so that sewer gas in the meantime came into the house: on Tuesday one girl was ill with a bad throat, her sister also caught it, and both died of diphtheria. Three weeks previously there had been a case of diphtheria in a house in the rear, and the germs had probably remained in the sewer. Pneumonia appears to be infectious, as, in a house where there were seven children, one after another was ill with the disease, probably due to using the same handkerchief or food-vessel. It was surely possible as a means of prevention to kill the germs of diphtheria, typhus, and other infectious diseases while in the drains. Liquid disinfectants were not however sufficient alone, gaseous ones were also required, as the germs might be in the air or on the upper portion of the sewer-pipe.

Mr. H. C. Soper (London) said there appeared to be very little disease or illness among the flushers of sewers, and if sewer air were so deleterious how was this to be accounted for?

Mr. J. Cave (Kensington) asked whether parasites in meat could be killed by freezing.

Mr. Wood (London) said that Anthrax germs brought to the laboratory in cold weather when inoculated into animals took some days longer than usual to develop.

The Chairman moved a vote of thanks to the Lecturer.

Mr. Wynter Blyth (London), in reply to the several questions that had been asked, said that Thames water must often be much polluted, at the time of the Henley Regatta for instance. A great

deal of the pollution was destroyed by fish, micro-organisms, and oxydation, and about nine-tenths of the remainder was arrested by the water companies' filters. Cisterns for the storage of water are undesirable if they can be avoided, and the water is often polluted by the cisterns being contiguous to closets, stables, &c. Cream can be sterilised by heating intermittently to a lower temperature than boiling, for example about 80° centigrade. It is a remarkable fact that although there is evidence of cream being contaminated with disease, there is no definite evidence that butter or cheese have been contaminated in the same way. Cases of typhus fever are probably sometimes wrongly reported, but mistakes of diagnosis are sure to happen where the patient is only seen once at the commencement of the disease. Probably, however, more are overlooked than wrongly certified. The causation of diphtheria is very obscure, and the case given by Dr. Nunn was of real use in considering the question. It would appear in this case to have been breathed, as no doubt it may be, but it can also be swallowed. Disinfection of sewers could not be perfectly carried out, but in cases of infectious disease house drains might be disinfected by carbolic acid or corrosive sublimate. This, however, should not be done as an ordinary proceeding. The immunity of sewer flushers proves that most of the infectious maladies are swallowed and not breathed. Then again, sewer flushers have only short hours of work, and in many sewers the air is not very bad. With regard to the freezing of microbes, experiments show that activity is only arrested and not destroyed.

THE SEWERAGE OF THE TOWN OF MALDON, ESSEX,

WITH SOME OBSERVATIONS ON RECENT PRACTICE IN SEWER VENTILATION,

By Richard F. Grantham, M.Inst.C.E.

Read at a Sessional Meeting, December 9th, 1891.

Maldon is situated on the River Blackwater about ten miles from the sea, and contains a population of about 5500 in about 1250 houses. The river, which is here tidal, flows round the north and east sides of the town. The main part of it stands at a level varying from about 120 to 40 ft. above the sea. It is approached on the north by a steep hill rising at the rate of about one in eight, while on the south side the land gradually slopes down to the marshes lower down the river. An outlying and perfectly flat portion within the Municipal Boundary, with only a few houses on it, extends on the north side of the river.

Hitherto the larger portion of Maldon has drained towards the south through ditches into a creek, joining the river about a mile and a quarter below the bridge by which the town is approached on the north side, the other parts of it draining direct into the Blackwater at various points higher up.

After the usual preliminaries in preparing plans and obtaining the sanction of the Local Government Board, a contract was entered into in 1889 for the execution of the works, as designed by the Author's firm, to sewer only that larger portion which falls towards the south, the other parts, which must drain into a low-level sewer, not being taken in hand at present. The works of main sewerage, as well as of the house connections, have been carried out accordingly for the drainage of about 1000 houses, containing a population of about 4500.

A general description will suffice for these main works. The house connections have been carried out strictly in accordance with the law, as the author understands it, so that a reference

to them may form a basis for comparison with work done in other places.

The separate system of sewerage was adopted, except as regards gullies at the backs of the houses, through which a good deal of rain-water finds its way into the sewers.

The sewage is discharged from storage tanks through a cast-iron outfall pipe into a creek, passing through saltings, and joining the main channel of the river about 400 yards outside the river tidal walls, and about a mile and a quarter below the town. The high tides generally cover the saltings, but the sewage is not discharged into the creek until the tide has fallen below their level, or about one hour after high water. It is then discharged until the time of low water at Scales Point, at the mouth of the river (about ten miles below the creek), that is between four and five hours from the commencement of the discharge, when the penstocks in the tanks are closed.

The tanks which store the sewage during the flood tide, are built of concrete, and contain 115,000 gallons up to the level of the overflow. They are divided into two compartments by a wall down the middle, and are covered with brick arches for the greater part of their length. The iron outfall pipe is 15 in. in diameter, and 460 yards in length. It has a gradient of 1 in 1380, and one ventilating shaft on the inner side of the river wall. Beyond being strained through a wrought-iron grating, with half inch spaces, the sewage is not filtered or treated. The sludge is taken out of the tanks and deposited and dug into the land enclosed for the tanks. From the tanks upwards the 15 in. cast-iron pipe is continued across the fields for 600 yards as far as the main road out of the town.

The subsoil in the marshes, through which the iron outfall pipe is laid, is soft alluvial deposit with beds of drift gravel from 4 ft. to 5 ft. below the surface. Where there was no gravel, the iron pipes were embedded in concrete 1 ft. 6 in. to 2 ft. thick up to half the diameter. The subsoil in the town for the most part is London clay with fine green veins in it, making it extremely slippery. The streets were found to be riddled with old drains of very imperfect construction, and leaky water and gas pipes, so that a large quantity of timber shoring had to be left in the trenches. At the highest part of the town clean gravel and sand, containing water, were found a few feet below the surface. Where the depth at which the stoneware pipes were laid exceeded 11 ft. concrete was filled in round them up to half their diameter. In the course of his experience in other places the author has come across pipes split longitudinally, apparently by the weight of the superin-

cumbent earth. He, therefore, thinks they should always be embedded in concrete where the depth exceeds a certain limit.

The sewer pipes in the town vary from 6 in. to 15 in. in diameter, and the back sewers are mainly 6 in., the separate connection of a house with a back sewer being 4 in. in diameter. The total length of main sewers is 7700 yards; of 6 in. pipes in house connections 5670 yards; of 4 in. pipes 1854 yards; and the number of manholes is 59; of lampholes 33; of ventilating columns and shafts on the main sewers 11; of syphon traps 259; of ventilating pipes to house connections 146; of inspection chambers 27.

The flattest gradient on the main sewers above the tanks is 1 in. 454 on a 15 in. pipe for a length of 537 yards, but the flow of sewage in it has been sufficient to keep the sewer perfectly clear. Where necessary, flushing valves and storm overflows have been built into the manholes.

The larger number of houses was found to be connected with sewers carried round at the back, and communicating with the shallow and imperfect old town sewers. These back sewers consisted in some cases of old brick drains with flat bottoms or no bottoms at all, pipes with imperfect joints, butt-end pipes all more or less choked with deposit.

In the new house connection works, two principles were acted on, viz: that where single houses were already connected with the old shallow system, new connections as far as they crossed the public streets were made with the new sewers at the expense of the Corporation; that new connections were made across the public streets with the back sewers, and each of these if found defective within private property was taken up and relaid as far as it was connected with more than one house drain, or as far as the last gully used by more than one house at the expense of the Corporation. Defective drains of single houses within the boundaries of private property were regarded as nuisances and notices were served on the owners to abate them and make good the drains. To make the distinction clear according to the Parliamentary definition, the conduit from a single house or from a gully used by a single house is a "drain," while the conduit from more than one house, or from one gully used by more than one house, is a "sewer." All the gullies at the backs of houses covered with bell traps were done away with, and stoneware gully traps inserted in their places.

Just outside the boundary of private property, syphon traps with air inlets were fixed on all new connections, and have been found to answer fairly well, but owing to a deficiency of water supply a few have been choked with deposit. At the upper ends of most of the back sewers 4 in. heavy round rain-water

pipes, or 6 in. by 4 in. square pipes, were connected, and fixed to the walls of houses and carried for ventilation from four to five feet above the roofs with conical hoods on top.

Changes of opinion and practice in regard to sewer ventilation have taken place since Messrs. Boulnois and Collins' papers* on the subject at the Congress of the Sanitary Institute at Dublin in 1884, and important changes seem to the author to be foreshadowed in the paper read by Mr. Crimp and Mr. Read at the recent International Congress of Hygiene. It will perhaps be of advantage to consider in what direction investigations in the future should be undertaken.

The primary conditions now fully recognised, which cannot be too strongly insisted upon, for preventing the accumulation of foul air, are sufficient falls in the sewers, construction of the best kind, proportions to suit the expected volume of sewage, so as to give a self-cleansing velocity, flushing where necessary, and as many openings into the outer air as practicable. But while open gratings at the street level, placed at intervals as frequent as possible, have hitherto been considered essential, and in the absence of any other method sufficient for the ventilation of sewers, the foul air occasionally escaping from them is offensive, and they are frequently rendered useless by being stopped up in response to complaints.

At one time trays and baskets containing charcoal were introduced into the buckets under the gratings to deodorise and purify the air from the sewers. At the best the charcoal was effective for only a short time, and moreover it was found to retard the free passage of air.

Mr. Boulnois in his paper at the Dublin Congress† described the various methods and contrivances introduced since 1848 for the improvement of the ventilation of sewers. All these, however, whatever their merits, have fallen into disuse, so that no further allusion to them need be made. Destructors involving the burning of gas have been and are now being used, but so far the results have not been better than those obtained from the simple shaft.

Recent investigations and experiments show that tall shafts carried well above the house tops cause an improvement in the air of sewers, although, as it was tersely put by Mr. W. Haywood, Engineer to the City Commissioners of Sewers, in 1858, before a Select Committee of the House of Commons, "instead of your having the stink in the streets you have it at the house tops." There is, however, this difference, that in the

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* Transactions of the Sanitary Institute, Vol. VI.
† Transactions of the Sanitary Institute, Vol. II.

streets the air is confined between buildings and its circulation is influenced by draughts and eddies, while sufficiently high above the house tops it is at once dispersed by the wind.

Mr. Santo Crimp has clearly shown by his experiments at Wimbledon* that the measurable movements of the air in sewers are due to the force of the winds, and not, as has been supposed, to the difference of temperature between the sewer air and the air above ground, and that the direction of the currents of air is as likely to be downhill as uphill. He concludes that the street ventilators should be reduced to a minimum, and he is in agreement with Mr. Read, the City Surveyor of Gloucester, that ventilating pipes should be carried as high as possible.

Experiments made also by Mr. G. R. Strachan, at Chelsea,† with three ventilating shafts—12 in., 15 in., and 12 in. in diameter, and 31 ft., 32 ft., and 22 ft. high above the level of the street, respectively—showed that in a brick sewer, 3 ft. 9 in. by 2 ft. 6 in., the air was changed every 31½ minutes during 44 days, and that the beneficial influence of the fresh air admitted was observed for at least 100 ft. on each side of the downcast or centre shaft. No complaints, says Mr. Strachan, have been made as to air passing out of the upcast shafts, either by the occupiers of the houses, or by the neighbours, or by persons using the street.

It will be remembered that Col. G. E. Waring, junr., in a paper‡ read before the Sanitary Institute, in 1880, described the system of ventilation he had carried out in the sewerage of the City of Memphis, U.S. For the size of the city, which contained 40,000 inhabitants, comparatively small pipes were used for the main sewers, but the fixing of an unobstructed ventilator, 4 in. in diameter and reaching to the top of the house, was made compulsory in every case of house connection. At the lower end of each connection a fresh air inlet was placed. The house branches were restricted by law to 4 in. in diameter. By this means there was on an average one 4-in. ventilator to every 30 ft. of sewer, besides the air inlets at every lateral. There were, moreover, no manholes or lampholes and a disregard of alignment in the sewers.

Connection with tall furnace chimneys has been tried and a powerful current thereby induced, but its effect for any distance has been found to be destroyed when there are many inlets in the sewer, the supply of air being drawn with great force through

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* Min. of Proceed., Inst.C.E., Vol. XCVII.
† Min. of Proceed., Inst.C.E., Vol. LXXXIV.
‡ Transactions, Sanitary Institute, Vol. II.

them. In reporting upon the ventilation of the Brighton Sewers, the late Sir Joseph Bazalgette found that by means of flaps which had been placed across the outfall sewer at Roedean to prevent air from the lower end of the outfall from passing above this point, a continuous current was drawn down the sewer by means of the furnace kept constantly burning at the bottom of the lofty ventilating shaft erected there, and that the current was perceptible at the Steine. The distance is about two miles, but there are only four small openings all the way. The furnace ventilation, however, is interrupted in Seasons when the sewers become charged with storm-water. The conditions in this case were, however, especially favourable, for where there are many inlets into sewers, the draught induced by factory or tall chimneys can reach only a little way along the sewer so that isolated shafts of this kind produce very little effect.

At Hornsey, Croydon, and Twickenham, numerous upcast shafts have been erected to improve the ventilation of the sewers, and Mr. de Courcy Meade, of Hornsey, finds that in his district there is now seldom a complaint of smell from the road ventilator, although the street gratings are left open.

Mr. Thomas Walker of Croydon, in a paper read in 1890, before the Municipal and Sanitary Engineers, testifies to the general cessation of smells from the street gratings on the fixing of pipe shafts. He also states that a greater volume of air (31 cubic feet per minute) passed up an ordinary shaft per hour than through a Keeling's destructor (25 cubic feet per minute). By the year 1890, about 250 upcast shafts (6 in. and 8 in. round pipes, and 8 in. by 6 in. rectangular pipes) had been erected, and more were constantly being put up. The manhole gratings were not closed except in a few instances where they were near the footpaths. In his opinion the ordinary shaft is as effective as a Holman's gas destructor and more economical.

The position of the pipe shafts must be most carefully chosen, and they must be carried up to a proper height; but any risk of nuisance (and according to the author's experience it is very small) is obviated by there being a good number of them.

In Mincing Lane, London, where complaints of effluvium from the street gratings had formerly been made, two ventilating pipe shafts about 60 feet high were erected, another about 70 feet high, and another about 90 feet high, measuring from the ground level, all 5 in. in internal diameter. Since their erection no complaints have been received, but the gratings in the street have been closed.

In Liverpool the system of ventilating the sewers by means of shafts carried up the sides of buildings has been extensively adopted, and is found to answer very satisfactorily. There are

about 890 already fixed, the larger number 6 in. in diameter, and the remainder 9 in. by 6 in. rectangular. Here also the street gratings have been closed.

In Birmingham some difficulty has been experienced in getting owners to consent to the erection of shafts. About 15 have been fixed of 6 in., 9 in., and 12 in. in diameter, and 9 in. by 6 in. rectangular in the higher parts of the town. Since their erection complaints with regard to smells in the neighbourhoods in which they have been fixed have been less frequent.

Similar difficulty in getting the consent of owners of houses has been found in the district of Willesden. About 45 upcast shafts have been fixed up to the present time. The pipes are connected with the manholes, the connecting pipe graduating from 15 in. or 12 in. to 6 in. At the foot of the upright pipe a small chamber is constructed to receive any scaling that might occur from the iron pipe, and to afford facilities for cleansing. A series of daily tests of the air currents have been instituted, and the velocity has been found to be equal to 550 feet per minute, and the volume 108 cubic feet per minute.

At Maldon, besides the gratings at the street level, cast-iron columns 22 ft. high and 5 in. in diameter at the top, were erected in open spaces, and in other places heavy rectangular rain-water pipes, 6 in. by 4 in., carefully jointed, were connected with the main sewers and fixed against the sides of houses and carried 4 ft. and 5 ft. above the roofs without a bend in their height. Where there have been complaints of bad smells from the street gratings the nuisance has generally been traced to a deposit either discharged from, or remaining in, the old and generally offensive connections.

The air inlets to the new house connections, which were only carried across the road to be connected with the old pipes, proved excellent detectors of stagnation in the old drains. Where bad smells were noticed the old drain was traced up and, if necessary, re-laid, and the smell ceased.

In the foregoing examples and experiments there is a unanimity of opinion and practice in regarding upcast shafts as necessary adjuncts to sewers. The author, however, does not go so far as to advocate the abolition of open gratings at the street level over manholes and lampholes, inasmuch as with the erection of a sufficient number of shafts offensive smells from the gratings have been found to cease, and these openings act as air inlets. He would, therefore, prefer that they should be made to open and close at will. At Maldon the covers are fitted with Latham's cover and bucket, without the spiral trays for charcoal. By the raising or lowering of the bottom of the inner

cylinder of the bucket by means of a small handle the passage of air from the sewer can be stopped if it is found offensive. Nearly all, however, are kept open.

Hitherto upcast shafts and other contrivances have been added from time to time to the systems of sewerage, but there is sufficient evidence of their efficiency to suggest their forming a part of the designs of all new systems. It is not always possible to find suitable places for them at regular intervals especially in large towns, but in the smaller towns there is not much difficulty in getting permission to erect them.

Mr. J. W. Brown, Borough Surveyor at West Hartlepool, in his Annual Report states that he has been very successful in getting leave from various property owners for erecting them in positions corresponding to the open gratings in the street. He adds that the system is "working very satisfactorily, as in all cases when a pipe is erected a strong current of air is found coming from the sewer, and the smells previously complained of at the street level cease."

Mr. T. Walker, of Croydon, says that there was very little difficulty in getting permission to put up a ventilating pipe where there was a bad smell from the street grating. It was obtained on the understanding that it is to be taken down in twenty-four hours if the owner or occupier request it. 146 ventilating pipes to the back sewers were erected at Maldon out of 165 proposed to be fixed, there being only nineteen objections.

If stagnation and consequent deposit in the sewers be avoided, the translation of the sewer air from open gratings at the street level to above the roofs of houses, so far as present experience goes, is not accompanied by either nuisance from bad smells or danger to health, provided the shafts are sufficiently frequent, and are carried up well above the roofs.

Any material or contrivance introduced into the manholes or shafts through which sewer air passes has served only to retard the passage of the air without a sufficiently compensating advantage. In the author's opinion the upcast shaft should be as straight and as clear of any obstruction as it is possible to make it.

The practice of establishing upcast shafts for the ventilation of main sewers is obviously increasing, and no doubt it will in time be generally adopted. Also much work has been done in improving both the laying and ventilation of house drains, which at the present time are necessarily trapped to prevent the air from the main sewers passing up them, and are provided with air inlets and ventilating pipe shafts.

This system is practically a defence, and in the present day a

very necessary one, against the imperfections of the main sewers, and sometimes of the house drains themselves; and as the practice of more thoroughly ventilating the main sewers becomes more general, a dual system of upcast shafts will be established, for which there does not appear to be sufficient reason in a perfect system of sewers.

The beneficial effect observed from the increasing practice of erecting upcast shafts on the sides of houses and elsewhere, to ventilate the main sewers, coupled with the absence of any danger or prejudice to the public health if they are carried sufficiently high, suggests the consideration whether the main sewers might not be advantageously ventilated through the house drains, omitting the syphon traps now usually fixed in those drains outside the houses.

No artificial and costly means of exhausting, purifying, or burning the air would be required.

There is a passage in a paper* read some years ago before the Royal Institute of British Architects which very clearly points out the true aim of sewer ventilation :—"I regard it," the writer says, "as a preventive and not a curative agent; that is, it is intended not to permit sewer gas and effluvia to escape without doing injury, but to prevent sewer gas and effluvia coming into existence;" and he goes on to say, "Where practicable, it is desirable the ventilation of drains should assist in the ventilation of sewers, so that the circulation of atmospheric air in sewer and drain may be as copious as possible." As we have seen in the examples given, the powerful currents created by a number of upcast shafts undoubtedly promote a circulation practically sufficient in well constructed and properly laid out sewers to keep the air inodorous and harmless when passing up the house drains into the air above the roofs.

Mr. J. C. Bayles, of New York, remarks†:—"If every manhole cover in our streets were replaced with a grating as open as might be consistent with strength, and these were kept free from ice, snow, and mud by men employed for the purpose, and every house owner were required to vent his soil pipe (unobstructed by any form of trap along its line) above his roof, the ventilation of our sewers would be accomplished."

Once more. Mr. Rogers Field has said‡:—"If sewers are properly constructed, properly flushed, and thoroughly ventilated, you will have practically no smell from them—no

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* Transactions R.I.B.A., 1831-1882.

† "House Drainage and Water Service." 4th Edition. J. C. Bayles, New York.

‡ Transactions R.I.B.A., 1880-1881.

appreciable smell. Where you get the smell is where the sewers do not carry the foul matter away, where it remains, and where it decomposes. It is, however, a great mistake to imagine that foul emanations come exclusively or principally from sewers. They come quite as much from defective house drains." And he proceeds to say that "the result of making the whole of the drainage arrangements self-cleansing is that foul gases are no longer generated, and the ventilating pipes no longer send forth foul emanations."

The author agrees with the foregoing remarks, and believes that with improved conditions in course of time the two systems of ventilation, one for the main sewer and the other for the house, may be amalgamated, and syphon traps in the house drain outside the house may be omitted.

He submits that in view of the evidence he has put forward future investigations should be conducted in this direction.

In conclusion, he desires to record his thanks to Mr. Thos. Walker, Mr. T. de Courcy Meade, Col. Haywood, Mr. Percy Boulnois, and others, for the valuable information they have given to him.

The Chairman, in opening the discussion, said that they would notice the great improvement that had taken place in the state of the Museum. This was entirely due to the liberality of Mr. Rogers Field, who had given a donation of £250 to the Institute, in order that the Museum might be put into a proper state, and to print a catalogue of the various articles which are disposed in the building. They all appreciated the great value of a Museum of this kind, and they all hoped to see from time to time its usefulness extended. In the state in which it was previously, without a catalogue, the Museum was of relatively little use. Now those who wished to consult what they might find there had every facility for doing so placed in their way. No one knew more the value of being able to have sanitary fittings properly arranged for inspection, and new inventions so exhibited that they could be examined and appreciated, than the donor.

Mr. De Courcy Meade, M.Inst.C.E. (Hornsey), moved the following resolution:—"That this meeting desires to express its appreciation of the increased utility of the Museum for the purpose of giving information to the public, and desires to record its sincere thanks to Mr. Rogers Field for his generous donation, which enabled the Council to carry out the re-arrangement and prepare a catalogue of the Museum." He had great pleasure in adding his testimony to the usefulness of the Museum." Although he had just been introduced to the meeting, he had been in the habit of visiting the Museum in the daytime, and though that was the first meeting he had attended,

he hoped it would not be the last. He found the catalogue of the greatest use. The manner in which it was arranged enabled one to pick out exactly what he wanted to see in the least possible time.

The resolution having been seconded and cordially carried,

Mr. Rogers Field, M.Inst.C.E. (London), who was received with loud applause, said that he was very much obliged for the resolution passed, and certainly the best thanks that he could have were such observations as those which had just fallen from Mr. de Courcy Meade. He (Mr. Field) had felt for a long time that there was a great deal in the Museum that was exceedingly valuable, and that could not be used because of the imperfect arrangement, so that an undertaking which ought to have been creditable to the Sanitary Institute was discreditable to it, simply because there were no funds available for arranging the Museum properly. This feeling was intensified in view of the International Congress of Hygiene, as it would have been a disastrous thing for visitors to come to see our Museum and go away and report all over the globe that it was a miserable affair. He, therefore, determined to do what he could to help in the matter, and he was very pleased to hear from Mr. Meade that the re-arrangement and catalogue really rendered the Museum useful for the purpose for which it was intended.

Dr. Louis Parkes (Medical Officer of Health for Chelsea), referring to the medical aspect of Mr. Grantham's paper, said he disagreed with that part of it which advocated the abolition of the disconnecting syphon traps in house drains. He thought they were a very proper and necessary precaution to take, inasmuch as sewer air might at any time contain the poison of infectious disease —notably typhoid fever—in this country, and it was advisable to exclude such air entirely from house drains and soil pipes, which were not always perfect, even when newly laid and fixed. He argued that the sanitary authorities having constructed the sewers ought to ventilate them, and not expect the householder to do so. A householder should only be called upon to look after his own house, and leave all the other householders to do the same. Referring to the system of ventilation in Chelsea, Mr. Grantham had overlooked one fact. In the system of ventilating a dead-end sewer, 600ft. long, which had been in operation for some years, the air was brought into the sewer by means of a revolving cowl facing to the wind. The system had been tested, when there appeared to be no air whatever during fog and damp, and it had been found that a considerable quantity of air was entering the sewer, and that the whole of the air in the sewer could be drawn out and renewed every hour. He contended that they could not do away altogether with the roadway ventilators. They could do away with the offensive ones and substitute shafts, but if they did away with every roadway ventilator and substituted long and crooked shafts they would be merely reverting to the old system of unventilated sewers which everybody condemned. There were, in Chelsea, very few complaints of smell from the roadway ventilators

over local or parish sewers, the complaints mostly relating to main or County Council sewers. In these main sewers in London the sewage had often travelled great distances, and was stale and even putrid in hot weather, consequently the gases given off were copious and most offensive. On the embankment at Chelsea, over the low-level intercepting sewer, the smells were notorious, and interfered with the proper enjoyment of that picturesque promenade. He thought that in such cases roadway ventilators should be abolished, and the sewer air should be extracted by furnaces and cremated. The paper of Mr. Grantham was admirably adapted to bring out an interesting discussion on sewer ventilation, and he had listened to it with great pleasure.

Mr. DE COURCY MEADE (Hornsey) added his testimony to the value and interest of Mr. Grantham's paper, though the subject of sewer ventilation was by no means new. It was one which latterly they had been afraid to bring before another Association with which he was connected, because there was no stopping the discussion. Mr. Grantham had described a small town where the existing sewers were in a defective state, and many of them apparently at the back of the buildings. From his own experience he could say that these drains were most difficult to deal with, and often involved compensation. He would like to ask if compensation had been paid in the cases the lecturer had illustrated. He hoped not. He hoped the people of Maldon were more enlightened than some people he knew of. With regard to the flushing of sewers and drains, he said that in Hornsey they spend about a £1,000 a year for water for sewer flushing, but they are as yet unable to deal with the house-drains, although much sewer-gas was generated in them, and he thought that provision ought to be made for flushing all house-drains, either by automatic flushing tanks or by some other means. He thought that it would be a mistake to try and ventilate large sewers, such as described by Dr. Parkes, by means of small pipe-shafts only, as the amount of air space in the sewers varied considerably at different times of the day. Some of the City sewers, for instance, were running about three-quarters full at 2 p.m., and only about one-sixth or less at 11 p.m. In such sewers small pipes would have little effect, unless placed at short distances apart and supplemented by mechanical means. Mr. Meade incidentally mentioned that the street-lamp ventilating columns, though not handsome to look at, answered their purpose admirably when not in the immediate neighbourhood of houses.

Mr. E. BAILEY DENTON, M.Inst.C.E. (London), criticised the paper with some severity. He said that if the abolition of the disconnecting chamber between the house and the public sewer was aimed at he begged to entirely disagree with Mr. Grantham. He looked upon the provision of disconnecting chambers as most essential. When the millennium came, and they could be sure that workmen would do their duty and would not scamp their work, they might perhaps be able to do away with the disconnecting chamber, and rely on street

manholes and upcast shafts to effect all the necessary ventilation. But until then each house should have one, for by their provision the dangers of sewer gas entering our dwellings was minimised. In his opinion there was no place in England which should be more thoroughly and uniformly provided with the disconnecting chambers than Maldon, because, as Mr. Grantham had told them, the penstocks at the outfall were closed for four or five hours out of the twenty-four. In fact the town of Maldon was very similar *quâ* sewerage to Brighton. Mr. Grantham had "damned with faint praise" Sir John Hawkshaw's shaft at Brighton, but he (the speaker) could assure the meeting that it had never been of any good whatever. It did not draw as far as the town. In times of rain when the penstocks were closed, sewer gas escaped from the sewers into the streets, and where no disconnecting chambers were provided it could and did enter the houses. The same thing would certainly happen at Maldon as at Brighton. Mr. Grantham had spoken in favour of 6-inch sewer pipes. In his (the speaker's) opinion they should never have less than 9-inch pipes, for 6-inch pipes frequently got choked up. Then Mr. Grantham had told them that his firm had constructed thirty-three lampholes in Maldon. Unhappy Maldon! He regarded lampholes as a retrograde substitute, for in cases of accident they were practically useless, being inaccessible, and he insisted that manholes were the proper things in every sewerage system, for their cost was but little more than that of lampholes, and they were the means by which a sewerage system could be kept free from deposit and be under proper control and inspection.

Mr. Read (Gloucester) said there seemed to be an opinion prevalent, not exactly expressed but implied, that ventilation was the cause of sewer-gas. Ventilation never caused sewer-gas yet, and never would. It only made it apparent. Deposit in the drains and sewers and stagnation of the sewer air were the causes of sewer-gas. Replying to the observations of Dr. Parkes, he said that for the private owner to hide himself in his shell might be all very well for the private owner, but the general prevalence of that policy would never get rid of sewer-gas, but would increase it, because such policy rendered the proper ventilation of sewers impossible; the so-called interceptor being an obstruction, both to the flow of the sewage and to the ventilation. From experiments that he had made, he had come to the conclusion that when the flow of sewage equalled or exceeded three feet per second, the direction of the air-current in the sewer was nearly always the same as the flow, that is down hill. To ensure that there should always be a down-draught at the street-ventilators, it would be necessary to keep them comparatively small, say 30 to 36 square inches area and 60 to 100 yards apart, and to have an up-cast shaft on every house, but in any case the excess of ventilating area should always be on the side of the outlets, to allow for friction and bends. That is to say, the sum of the sectional areas of the outlet shafts between any pair of street inlets, multiplied by the average velocity of their several discharges, must exceed the

sectional area of the air-space of the sewer, multiplied by the velocity of the air-current in the sewer. When these proportions are established, the air-current will always enter at the upper of the pair of street inlets, travel down the sewer and up the shafts, and the same thing will occur with each 60 or 100 yards of sewer so treated, and every such length will be thereby isolated as far as ventilation is concerned.

Mr. Thomas Walker (Croydon), speaking on the "flushing" question, said that in Croydon they were flushing every house drain in the borough at every opening they could get at, and as a consequence the cessation of the smells in the roads had been most remarkable. Criticising the Keeling Destructor, he said that one of the ordinary columns in use at Croydon up a tree or a house was more effective. This was proved by exhaustive trials, using anemometers to measure the volume of air extracted.

Mr. Rogers Field, M.Inst.C.E. (London), said he considered six-inch pipes amply sufficient for back drainage, but whether six-inch pipes were sufficient for town sewers was a different question. He drew attention to the City of Memphis, U.S., where the sewers were mostly six inches, and he thought the experience gained there with reference to sewers—ordinary sewers as distinguished from back drainage—was that it was not advisable to have them so small as six inches. But to say they should never be less than nine inches was wrong. Seven or eight inches would act very well. and get over most of the risks from choking. On the question of manholes, Memphis had also afforded them some valuable experience. At the Congress of the Sanitary Institute held at Exeter about ten years ago, the President, Sir Robert Rawlinson, made this observation with reference to Memphis: "He did not agree with the absence of manholes. He thought it would be found that there must be manholes, or there would most certainly be chokings, and with manholes there would be no necessity to break up the roads to find the spot." He (Mr. Field) made some observations to the same effect. Now the experience since gained at Memphis was that they had had to construct manholes in consequence of the frequent occurrence of stoppages. Memphis also had no disconnecting traps. He did not gather that the lecturer advocated the practice, but that he simply threw out the idea as a "feeler" and for discussion. Personally he (Mr. Rogers Field) held a strong opinion on the subject. As things existed now, and as they were likely to exist for some time to come, he considered they must have disconnecting traps, but it was essential that these traps should be well and properly made and always perfectly accessible. Even assuming that the sewers were perfect, he thought it was very doubtful whether it would be advisable to dispense with disconnecting traps, as disease germs would at times be carried into the sewers, and it was undesirable that these should pass into the house drains. With reference to the ventilation of sewers, he thought that ventilating shafts for town sewers were very valuable

if the street ventilators or most of them were left open, but to close all the street ventilators and substitute a few small shafts, as was sometimes done, was a great mistake. Absence of smell in the streets in such cases was really only due to the closing of the street ventilators, not to the erection of the shafts, and the closing of the ventilators simply meant bottling up the foul gases in the sewers.

Mr. G. B. CARLTON (London) did not know any case in London where compensation was being given out of the rates in respect of back drainage. As the representative of Penge he urged that it was the best drained and the best ventilated district south of the Thames.

The CHAIRMAN, in reference to intercepting traps, said he had put in many thousands of them, and nothing he had since learnt would prevent him putting in many thousands more. He did not think any town or individual house would be safe unless it had one, for however perfect the sewers were, there would always be the danger of communication between the houses. There was wide difference of opinion with regard to the effects of sewer air, and in this connection he quoted, to the evident amusement of the meeting, the remark of an authority at the recent International Congress held in London, that the air of sewers was found to be purer than the air of the street level. As long as these differences of opinion existed it was better to take the safe course recommended in the familiar motto, "Prevention is better than cure." He commended the observations of Mr. de Courcy Meade with regard to the flushing of sewers, and said a system of sewers should be designed for the purposes of the district thirty years hence. It was essential in all systems that the utmost power for flushing should be introduced. After a reference to the systems of drainage which are approved in India, the Chairman concluded by proposing a vote of thanks to Mr. Grantham for his able and interesting paper.

Mr. R. F. GRANTHAM (London), in reply to the discussion, said that inasmuch as he had laid 259 traps at Maldon he could not be considered as advocating the immediate abolition of traps in all house drains. He desired, however, to create discussion, and more especially to promote investigation into the improvement of the ventilation of sewers; and he thought, judging from what was being done, that ultimately, with due precautions, the abandonment of traps might assist in effecting that object. Nor did he stand alone, for in Chelsea, referred to by Dr. Parkes, the Surveyor, Mr. G. R. Strachan, in his paper to the Institute of Civil Engineers, made a similar suggestion, and as far as Mr. Grantham understood Mr. Rogers Field's reference to Memphis, the absence of disconnecting traps there did not appear to have any ill effect, but on the contrary, with the numerous up-cast shafts to every house and a system of constant flushing the ventilation of the sewers was extremely good, although it had since been found necessary to construct manholes. With reference to the question of compensation, mentioned by Mr. de Courcy Meade, he

had been informed by the Town Clerk of Maldon that the compensation for back sewers was very small. In some cases 10s., in others 5s., and in two instances £5 and £3 respectively were paid, but in the great majority of cases there was no payment made. Mr. Bailey Denton had evidently not had time to read the paper, or he would have seen that no immediate abolition of traps was proposed, and none at all unless investigation showed that they might safely be omitted. The real point of the paper was the improvement of sewer ventilation, the abolition of traps being incidental, subject of course, to scientific investigation. He (Mr. Grantham) had not said that Sir John Hawkshaw's tall shaft in the Brighton outfall sewer had effected any good in the town. He had quoted Sir Joseph Bazalgette's report on the drainage of Brighton to show that he had found, by experiment, that the shaft did induce a current of air which was perceptible two miles up the sewer, and he pointed out that the current was partly due to the absence of any important opening in the sewer for that distance. Mr. Denton does not controvert this point. Seeing that about 300 traps and air inlets, and many ventilating shafts had been inserted in the new connections at Maldon, he did not follow Mr. Denton when he said that sewer gas would enter the dwellings there as it did at Brighton. It could not possibly do so. With regard to the 6-inch pipes complained of by Mr. Denton, there were only three instances where these were adopted, and the places where these were laid could hardly be dignified by the name of streets, but were rather short narrow alleys with rapid falls, and he could not help thinking that Mr. Denton would have also used them under the same circumstances. There was a tendency too in the present day to diminish the size of pipes where there are few houses and the supply of water is small, as at Maldon, in order to ensure a greater concentration and scour in the invert of the pipe, although he thought that this theory was sometimes carried too far. As to the lampholes, animadverted upon by Mr. Denton, they were required by the Local Government Board, and in the lengths which were mostly very short, to overcome bends in the streets; he considered the saving of expense was amply justified, while the results in actual working have proved perfectly satisfactory. The difference in cost between a lamphole and a manhole was nearly £11, and Maldon would have been much more unhappy at having to pay £350 in addition to what it had already expended. He quite agreed with Mr. Rogers Field in objecting to the closing of manhole covers or street gratings, and he felt indebted to Mr. Field for reminding the meeting that his object was rather to discuss and investigate the subject of the improvement of sewer ventilation than to advocate offhand any radical remedy. But he still was inclined to think that, subject always to careful investigation, it would be desirable to amalgamate the two shafts, viz., the one for the house drain and the other for the main sewer, and as improvements both in the construction of house drains and of main sewers increased, the trap in the house drain might be dispensed with, although the amalgamation might yet be effected without doing away with the trap.

LECTURE TO SANITARY OFFICERS.

On "Ventilation and Measurement of Cubic Space,"

By Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S.

1. Public Health Act and Model Bye-laws impose certain duties upon the Sanitary Inspector in respect to cubic space and ventilation.

The Public Health Act and Model Bye-Laws place certain duties upon the Sanitary Inspector in relation to cubic space and to ventilation, and it is therefore necessary that he should have a clear knowledge of the principles on which these questions are based; and the object of this lecture is to explain to you these principles.

2. Object of the lecture is to explain the physical laws which should govern the exercise of these duties.

3. Definition of, and method of calculating cubic or air space in a room.

Cubic space is the amount of air space which is allotted to each individual in any room which he may occupy; that is to say, assuming that there is an empty room 10 feet long, 8 feet wide, and 9 feet high, the cubic contents of that room will be 720 cubic feet.

If you place one individual in the room, he will have 720 cubic feet of air space. If you place two individuals, each will have half of 720, or 360 cubic feet; if three individuals in it, each will have 240 cubic feet of air space, and so on.

If in that room, instead of being simply rectangular, there are recesses, you must add the contents of the recesses to the room.

Thus, if there is a projecting window, 4 feet wide, and 3 feet deep, and 7 feet high, you will add 84 cubic feet; and the air space afforded would be 804 cubic feet to one individual, 402 cubic feet to two individuals, and so on.

On the other hand, if there are projections such as a chimney breast, you must take that out in calculating the cubic space.

Thus if there is a chimney breast 4 feet wide, projecting 2 feet 6 inches into a room of the general dimensions above-mentioned, you must deduct the 4 feet $\times$ 2 feet 6 inches $\times$ 9 $=$ 90 feet; thus the room would then have only 630 cubic feet.

You must, moreover, make a further reduction if there is much solid furniture in the room. In practice, however, it is scarcely necessary to make allowance for light articles; nor where there is not a material quantity of furniture.

4. Conditions which render space necessary

Let us consider what are the reasons, on the ground of health, why a certain air space or cubic space is wanted in an occupied room.

If you are in an open space out of doors, fresh air is perpetually flowing round you.

It has been estimated that the air of the atmosphere moves

at a rate of rarely less than 4 feet per second, and the average movement is from 8 to 10 feet per second.

In a room it is very different. In an occupied room you must more or less breathe air which has been already breathed.

Even out of doors the effect of congregating large numbers of persons together may prevent the free access of fresh air to those in the middle of a crowd.

As an instance of this it has happened that on a still day persons in the middle of a crowd have fainted for want of air.

We all know that in a room the assembly of a large number of people soon becomes unbearable. The reason of this is, as you all well know, because the respiration of the individuals in a room, their perspiration, the burning of candles, and all such matters, vitiate the air of rooms at a certain rate.

5. Impurity of air caused by the operations of life and breathing.

I will here briefly explain what is the nature of this vitiation.

Pure air consists of a certain amount of oxygen and a certain amount of nitrogen.

The oxygen supports life, but if we breathed it pure it would burn us away.

The nitrogen is an inert gas which dilutes the oxygen, and prevents it from being injurious to us in the process of breathing.

Every human being, in order to live, must be constantly breathing: in the act of breathing he takes in oxygen, and throws out from his lungs carbonic acid ($C O_2$); but he also throws off organic matter. This organic matter consists of epithelium, and molecular and cellular matter from the lungs; and is more or less in a condition ready to putrefy.

In addition to this matter from the lungs, portions of epithelium are constantly being given off from the skin. In hospitals you sometimes find pus cells in the air, which are given off from suppurating surfaces.

In the act of breathing there is also a large amount of watery vapour given off chiefly from the lungs, but also from the skin. Of this you may easily satisfy yourself whenever you occupy a confined space.

For instance, in a railway carriage, with the windows and ventilators closed, the glass panes will soon be coated with moisture, which is the condensation from the breathed air which has been saturated with this watery vapour.

The amount of watery vapour varies; but taking the amount given off by an individual from the skin and lungs together, it is enough to saturate about 90 cubic feet of air per hour, at a temperature of 63° Fahr.

This watery vapour is full of the organic matter which I told you just now is thrown off from the body, this organic matter being in a condition very ready to putrefy.

It is chiefly from the presence of this, in air which has been breathed, that injury arises.

If you shut up a person or an animal in a confined space without any change of air, they could not live for any length of time.

You all know the instance of the Black Hole at Calcutta.

In the year 1756, 146 individuals were confined in a small cell, known as the Black Hole of Calcutta. This cell was 18 feet long by 14 feet wide, by 10 feet high, being so small that the last person of the 146 had to be crushed in upon the rest with violence as the door was closed and locked. The only means of ventilation were two small holes in the door. In the morning 123 corpses were taken out, and 23 beings, who could scarcely be said to be alive.

Of course the larger the space, the longer would people live; but if there is no change of air, whatever the size of the room or space, the occupants would begin by suffering from head-ache or other forms of discomfort in proportion to the progressive vitiation of the air, and would all die after a certain time.

6. Measure of impurity in breathed air.

Thus the impurity of air caused by breathing is partly due to the organic matter thrown off the body, and partly to the carbonic acid which is dislodged from the lungs.

In most cases of bad ventilation the carbonic acid is not the chief cause of injury.

You may hold your head over a beer vat, where a very large amount of carbonic acid is being disengaged, without injury.

It would require the air to be vitiated with 5 per cent. of carbonic acid ($C O_2$) to destroy life.

The reason why breathed air, which may contain a much smaller amount of $C O_2$, produces such deleterious effects, is because the breathed air contains also putrefactive organic matter. It is this organic matter which is especially deleterious.

But the quantity of $C O_2$ in breathed air affords, under ordinary circumstances, a fair test of the quantity of organic matter present; and it used to be found less difficult to ascertain by test the amount of carbonic acid present in the air than the quantity of organic matter.

Carbonic acid has generally therefore been accepted as a measure of the impurity present in breathed air. It must be borne in mind that there is always a proportion of carbonic acid ($C O_2$) present in air; for instance, in air out of doors in the open country, there are from 3 to 4 parts of carbonic acid ($C O_2$) in 10,000 parts of air; and even this amount will sometimes be increased in a wood, or in proximity to a flock of sheep. In towns you will find sometimes a much larger quantity. Dr.

Angus Smith found as much as 6·8 parts per 10,000 parts of air in confined streets in a fog in Manchester; and Dr. Russell has found as much as 9, 11, and even 14 parts of $C O_2$ in 10,000 volumes of air, in a dense fog in London. It is the excess of carbonic acid found in confined spaces over that found in pure country air that is the measure of impurity; 4 parts of $C O_2$ in 10,000 parts of air is assumed as an average for air out of doors; when the air of an occupied room contains 6 parts per 10,000, the sense of smell enables the impurity to be detected, hence 6 parts in 10,000 have been allowed as the permissible measure of impurity in the air of occupied rooms. The presence of those minute organisms which have been recently brought into prominent notice by the increased attention given to the study of bacteriology, is also to some extent an index of impurity in air; but it is too soon as yet to lay down any fixed rules in this matter.

In order to counteract the effect of breathing, it is necessary continually to replace the air of an occupied room by fresh air, but it is of course impossible to keep the air of an inhabited room in as pure a condition as the outside air.

7. Quantity of air required to maintain a standard degree of impurity.

It is unnecessary to enter here into the details of the theoretical calculations of the quantity of air necessary to be introduced into a room in order to maintain the air at a sufficient degree of purity, or rather of impurity.

The results of these calculations are that, according to theory, it would require 3,000 cubic feet of fresh air to be supplied to each occupant of a room per hour to keep the atmosphere in a uniform condition. That condition is not the same as pure air out-doors. It is something less pure; and, as I told you above, it has been generally assumed as a standard of admissible impurity that the carbonic acid gas in the air of an occupied room, may amount to 2 parts per 10,000 over normal or outside air; that is to say that the air of the occupied room may contain 6 parts per 10,000 in all, without being deleterious.

If you place an individual in a room in which there is no change of air, the time required for the air to arrive at this state of impurity will depend on the size of the room; that is to say, on the cubic space in the room.

The following table shows the time required to effect this:—

One man in	10,000	cubic feet,	3 hours	20	minutes.
,,	5,000	,,	1 hour	40	,,
,,	1,000	,,		20	,,
,,	600	,,		12	,,
,,	200	,,		4	,,
,,	50	,,		1	,,
,,	30	,,		36	seconds.

Hence the possibility of people occupying continuously a given space depends upon the change of the air.

8. Effects of different proportions of air space on supply of air.

If you introduce fresh air into the room, and remove the vitiated air, the same quantity of air would have to be introduced in the case of the large room as in the case of the small room, but in the large room the change of the whole air of the room would occupy more than 3 hours; that is to say, would take place almost imperceptibly; whereas, if you shut a person up in a coffin, provided you passed continually fresh air through the coffin, so as to force out the air which had been breathed, a person could live perfectly well; but this would be a very uncomfortable arrangement, because he would live in a perpetual current of air.

On these grounds the cubic space, or the air space, which a room affords, is a very important element in considering the number of occupants which can conveniently and safely be allotted to a room, having regard to their comfort.

In barrack-rooms, it has been decided that 600 cubic feet per man should be afforded; that means a space of 10 feet long by 6 feet wide and 10 feet high. These are living rooms as well as sleeping rooms.

In workhouse dormitories, 300 cubic feet per occupant has been considered sufficient: that means a space of 4 feet by 7 feet 6 inches, by 10 feet high.

9. Floor space as contrasted with cubic space.

But although cubic space has been taken as the measure of accommodation which a room will afford, it is perhaps a somewhat unfortunate term, for if you put a certain number of individuals to sleep in a room, their being able to do so with either comfort or a due regard to health would rather depend upon the distance at which you place their beds apart than upon the cubic space they occupy.

Thus in a room, 15 feet high, affording a cubic space of 300 cubic feet per bed, each bed would be limited to 20 feet of floor space, or 6 feet by 3 feet 4 inches. But in a room affording the same amount of cubic space, viz., 300 cubic feet, but 10 feet high only, there would be 30 feet of floor space to each bed, or 6 feet by 5 feet.

Therefore, whilst a lofty room would leave the surface space very crowded, a lower room, having the same amount of cubic space, would afford access to the sides of the beds.

You will thus see that so far as comfort is concerned the floor space or surface space is a matter of far more importance than cubic space in the convenient occupation of a room.

But besides the question of convenience, there are other very important reasons why, in placing a number of persons in

one room, it is essential that they should not be placed too close together.

Each individual is a centre from which the deleterious emanations proceed. Therefore, the further apart you can place the occupants, the better opportunity do you afford for the air breathed by the various persons to be diffused.

If you have a number of people sleeping in a room, and if you desire to prevent them from suffering from the pollution of air as much as possible, you should have as large an interval as can be arranged between the different beds.

Therefore if you were building a room to accommodate a certain number of persons, and if you wished to provide a certain amount of cubic space, it would be better to keep the room as low as is compatible with efficient ventilation, rather than to have a very lofty room. And for this reason, in fixing the number of occupants in a room, your attention should be directed rather to the floor space than to the cubic space.

When I say that the room should be as low as possible, I mean as low as is consistent with the due circulation of air, and with the conditions necessary for renewal of air.

I have endeavoured to explain to you how the air of a room is rendered impure by the presence of persons in it. I have also told you that in order to counteract this, it is necessary to remove the breathed air and to replace it by fresh air.

I have also told you that theoretical results have pointed to 3,000 cubic feet of air per occupant as the quantity of air which should be supplied to keep the air in a satisfactory condition.

In practical experiments made in barrack rooms, it was found that an inflow through the special apertures for admitting fresh air and removing foul air equal to 1,200 cubic feet per occupant of air removed and replaced per hour, was sufficient with 600 cubic feet of space to keep the impurity of the air down to the standard before mentioned.

In hospital wards, where the emanations from the sick cause different conditions to prevail, an inflow of 2,000 cubic feet per hour, with a cubic space much enlarged, dependent on the condition of the sick, was found desirable.

10. Effect of materials, construction, and form of buildings on supply of air.

You will see that this is less than that given above by theoretical calculation. This need not be set down to errors in calculation or in theory, because the conditions under which the air flows in and out of a room are so varied.

The walls and ceiling themselves allow of a considerable passage of air. All building materials are porous.

If you look at any ceiling, you will see that an old ceiling is often blackened where the plaster has nothing over it to check the passage of air, and that where the wooden joists come and

the air has not passed so freely, it is less black.* If you break the plaster, you will find that its blackness has arisen from its having acted like a filter, and retained the smoky particles while the air passed through.

Moreover the porosity of the walls materially influences the moisture, for a porous wall may absorb much moisture; and on this account rooms with walls of polished impervious material require much more air to pass through them than rooms with porous walls, because, in the absence of sufficient ventilation, when the walls are colder than the air, moisture condenses on the walls, and runs down them.

Where no special arrangements are made for changing the air, ill-fitting doors and windows allow of the passage of a considerable quantity of air.

In a temperate climate, where the changes of temperature of the outer air are rapid and considerable, these means of producing the outflow from, and the inflow of air into, a confined space are in constant operation. A sleeping room is very warm at bed-time; a rapid fall of temperature outside occurs, and at once a considerable movement of air takes place through every available opening.

The majority of occupiers of sleeping rooms in England close their windows at night; they often block up the chimney by a register or otherwise to prevent the blacks falling. They have no special inlet or outlet for changing the air, and if it were not for the continual insensible change of air which passes through the walls, doors, and window chinks, &c., the occupants would be asphyxiated. A well-built house unprovided with special means for the inflow of fresh air is a real source of danger.

11. Efficient ventilation should be imperceptible

In order to afford the necessary change of air in a convenient manner, you must have a certain cubic space; and the great object of efficient ventilation is to enable change of air to take place without its being unpleasant from the draughts which it occasions.

12. Causes of movement of air.

This change of air is governed by certain natural laws.

Air consists of molecules, which are very loosely attached to each other, and small increases of temperature, or slight diminutions of pressure, allow these molecules or particles to separate: and thus a cubic foot of warmed air weighs less than a cubic foot of cold air.

For instance, at a temperature of 32° Fahrenheit, a cubic

* Where a ceiling is of brick with iron joists other conditions prevail, which I shall not enter into here, and the position of the iron joist is often marked by a black line.

foot of cold dry air, at the level of the sea, would weigh about 567 grains. At a temperatnre of 100° Fahr., a cubic foot of air would only weigh 497 grains; and at a temperature of zero, that is 32° below freezing-point, it would weigh 606 grains.

It follows from this that air, when it is warmed, expands and ascends; and air, when it is cooled, contracts and falls.

It also follows that as the warm air ascends, the colder air around rushes in to fill its place.

Everywhere this heating and cooling of the air is going on; the sun's rays warm the objects on which they impinge, these objects in their turn warm the air: the vicinity of a shaded surface cools the air: and thus both in turn cause movements in the currents of air.

In this room, as air is warmed by your bodies, it ascends; it comes against the glass of the windows or skylight, cools, and falls down. You say that you feel a draught from the window; that is not necessarily air coming in from the window; it may simply be the cooled air falling on you.

13. Laws which govern the movements of air due to natural causes.

It is on this law of the dilatation of air that all the movement of the atmosphere depends, from the winds and hurricanes to the ventilation of our houses, except where we propel air by fans or other mechanical appliances.

The law which regulates this movement of the air in a confined space, when the temperature is higher than that of the outside air, depends upon the following considerations:—

1. Upon the difference of temperature of the air inside the confined space, as compared with that outside.

2. Upon the area of the aperture through which the air passes.

3. Upon the height of the column of ascending air.

If A B represent the height of a column of air of the outside temperature t, and A C the height of a column of the same quantity of air expanded by the warmer temperature t', then the velocity at which the warmer air ascends will be that which would be acquired by a body falling from C to B.

The theoretical formula due to this is:—

$$V = \sqrt{BC \times 2g}.$$

And where V = velocity in feet per second.

H = height of shaft.

t' = temperature in shaft.

t = temperature out of doors.

a = co-efficient of dilatation of air, which for 1° Fahrenheit = ·00203.

The theoretical equation becomes $V = 8{\cdot}204 \sqrt{Ha(t' - t)}$.

But the actual movement of air in a flue is very different.

It is diminished by the resistance afforded by the chimney or flue in which the column of ascending air is contained. This resistance increases directly with the length, and inversely with the diameter or area, of the flue; and it also increases with the square of the velocity of the air currents. The resistance is, moreover, much influenced by the material forming the sides of the flue; with a sooty flue the velocity, with equal temperatures, has been found to be one-half that of a clean flue. The velocity is, moreover, diminished by any impediment to the ingress of the fresh air required to supply the place of that which flows out, and therefore an efficient system of ventilation requires that the extraction of air should be accompanied by arrangements for the supply of fresh air.

For these reasons it is preferable, in estimating the amount of air removed for purposes of ventilation from buildings already constructed, to measure the actual volume of the air in the flues or air passages; that is to say, to cause it to pass along a channel, the size and area of which are known, and then to measure the velocity with which the air passes through this channel.

The multiple of the area into the velocity in a given time gives the volume which passes through in that time.

14. Methods of measuring the movement of air.

There are various ways of measuring the velocity. It may be done by puffs of vapour of turpentine; by little balloons filled with hydrogen, and weighted to be of the exact specific gravity of air. A very convenient instrument is the anemometer, of which I show a specimen. The vanes are turned by the air, and the number of the revolutions, apportioned to the movement of the air, has to be ascertained in the first place by direct experiment, that is, by forcing a known bulk of air through a channel of a given size. That is to say, you provide a box or a cylinder of a certain size with a piston, and in connection with this box you place a tube of a known area and fitted to the size of the anemometer. You place the anemometer in the tube, and you note its reading. You then cause the piston to descend in a given time, and thus force the air contained in the box through the tube. You then note the reading of the anemometer; and thus ascertain the number of revolutions which coincide with the volume of air which has passed through the tube out of the box.

This method requires great care and attention, and the absence of all cross currents in the place where the experiment is made.

Another method for very roughly ascertaining the value of the revolutions of the anemometer is to draw the anemometer through the air at a given rate in a given time, and note the revolutions; but this is liable to many errors.

In heated flues and chimneys of manufactories Fletcher's anemometer is a very convenient form for measuring the speed of the air and gases.

The instrument consists of two parts. The first part consists of two metal tubes of about $\frac{3}{10}$ of an inch internal diameter, open throughout, and of any length; secondly, of a manometer, or pressure gauge.

Of these tubes the end of one is straight, while that of the other is bent to a right angle. When in use these tubes are placed parallel to each other, so that their ends are exposed to the current of air to be measured. They lie at right angles to the current, which thus crosses the open end of the one, and blows into the bent end of the other.

By this means a partial vacuum is established in the straight tube, whilst the pressure of the current forces the air into the bent tube. A differential manometer attached to the outer ends of the tubes shows the excess of pressure in the bent tube over that in the straight one.

The manometer used is a simple U tube set vertically, fitted with microscopes and vernier scales, and containing ether.

The difference of level of the surfaces of the ether in the two limbs can be measured to $\frac{1}{1000}$ of an inch. This difference of level between the columns of ether becomes a measure of the speed of the current passing the ends of the anemometer tubes; the law which governs the speed is expressed generally by the formula $v = \sqrt{p} \times 28{\cdot}55$. The corrections to be made for small variations of barometric pressure and temperature are unimportant.

This is a very convenient form of anemometer, because the pressure-tubes may be of any length or diameter, and may be connected with the manometer by india-rubber tubing of any length. Therefore the readings may be observed in any convenient place at a distance from the flues.

The pressure-tube should project into the air current to the extent of one-sixth part of its diameter, to measure the average velocity.

It is desirable, after observing the height of the ether in the tube then to reverse the connection with the manometer, and to take a second reading; if the smaller reading be deducted from the greater, twice the height of the column supported by the difference of pressure is obtained, and the error of observation is halved. But in this, as in the anemometer with vanes, there is a difficulty in accurately observing low velocities, *i.e.*, under one foot per second.

It is worth noting that a sheet of light tracing paper moved through the air at 2 feet per second takes up an angle of 45°,

and affords a ready means of measuring that velocity; and for smaller velocities the angle assumed by the flame of a candle affords a fairly accurate index, according to the following table:—

Velocity of flow of air. Feet per second.	Angle of inclination of flame of candle with horizon.
1·6	30°
1·0	40°
0·75	50°
0·50	60°
0·40	65°

15. Mechanical appliances for moving air.

Artificial methods in use for moving air may be classed as follows:—

1st. Movement by the application of heat to extract air, thus causing a vacuum which is filled up by fresh air rushing in to fill its place. Of this method the open fireplace is a familiar instance.

2nd. The use of pumps to draw out or to force in air.

3rd. The use of fans either to extract the air from or to force it into the space to be ventilated.

You will see from the formula for calculating the velocity of air in a shaft or flue that the velocity will vary either with the height of the shaft or with the temperature of the shaft.

16. Direct application of heat to movement of air.

Hence a tall shaft with a small increase of temperature of air may produce as high a velocity as a short shaft in which the temperature is high.

In this latter case, it would be necessary to consume a large amount of fuel to increase the temperature of the air which passes up the shaft.

Therefore the economy with which the law of dilatation of air can be applied in practice depends on the height of the shaft available.

If you require the extraction of air to go on continuously, you will find that a lofty chimney shaft will be the cheapest and most effectual way of securing your object. It is simple and permanent. It requires comparatively little repair, and no skilled labor to look after it.

Moreover, whilst a chimney flue acts by means of the dilatation of air, it also acts in another and occasionally very efficient manner. Whenever wind blows over the top of a shaft, it draws with it the air in the shaft, and causes an extraction; and as movement is almost always taking place in the atmosphere out of doors, you may almost always rely upon a certain degree of extraction of air from a house or a room by means of shafts carried up to above the roof, which is independent of the temperature of the air in the shaft.

17. Indirect application of heat by means of fans.

But if you only want ventilation to be put in operation from time to time, as in a meeting hall, it may often be found that when you take into consideration the first cost, the extraction of air by a properly constructed fan worked by a gas or other heat engine, would in many cases be more economical than the flue extraction: in all cases the warming of the air which takes the place of that removed must be taken into account.

18. Effect on movement of air of windows, and simple forms of inlets and outlets in rooms.

There are various methods by which the extraction of air may be effected by shafts and flues on a large scale; but we are here chiefly concerned with the application of these laws to ventilation on a small scale, that is, to the ventilation of separate rooms rather than of large buildings. All that I have told you respecting the movement of air governs the ventilation of your rooms where you have sash windows and fire-places; and the simplest way of securing an efficient change of air in a room without having resort to mechanical appliances, such as fans, or the direct application of heat, is to utilise the movement of the atmosphere, to which I have already alluded.

You have only to make an opening at the upper part of a room, out of which the warmed air can pass, and an opening at a lower level through which fresh air can flow in, to obtain a change of air.

For instance, if the top sash of your window is lowered and the bottom sash raised, the warmed air passes out of the room at the top, and the cooler outer air flows in below.

Your window can be arranged to form a very convenient inlet for fresh air, without causing a perceptible draught, by cutting a slit in the lower bar of the upper sash of a window, so as to leave a clear space of about a quarter of an inch along its whole length, through which the fresh air will be drawn in an upward direction.

Ventilators which act similarly to direct the current of air towards the ceiling are sometimes introduced into the upper panes of window-frames, such as hopper ventilators, or Moore's louvred panes; but these are all makeshifts: and although the windows, when they can be kept open, are the best means for the periodical renewal of the whole air in a room, every room should have special inlets and outlets for air, arranged so as to be independent of the windows.

If you have a room to ventilate which has no fireplace, and which is without openings in the lower part, and has no rooms above it, such for instance as a chapel or meeting house, or sometimes a stable, you can do so by means of a Watson's ventilator. This ventilator consists simply of a tube carried up to above the roof, divided into two parts by a vertical diaphragm

down the middle, one part being carried up rather higher than the other.

This diaphragm will cause a double current to be set up in the tube; an upward current of air will be established in the side of the tube which is carried up above the other, and a downward current will prevail in the other compartment of the tube, and the movement of air will generally be unaccompanied by unpleasant draughts.

There are now in general use several forms of simple ventilators, such as Watson's and Sheringham's, which *all* act more or less efficiently.

19. Effect of shafts without heat.

The most efficient, and at the same time most simple, method for removing the air of a room without having recourse to fans or other mechanical appliances is to carry up shafts from the room to above the roof so as to utilise the movements of the atmosphere, to which I have already alluded, to assist the movement which would naturally take place, partly from the warmer air of the room rising up through the shaft, and partly from the movement of the atmosphere outside, which, as I have already mentioned, will draw air up the tube.

Thus, if the atmosphere should be without perceptible movement in cold weather, when the temperature indoors is maintained for comfort above that out of doors, the difference of temperature will cause an upward movement in the shaft. In hot weather, if the shaft is colder than the outer air, a down current may probably ensue; but if in hot weather there should be little or no movement in the shaft, this occurs at a time when the windows can be kept open, and the air be renewed by this means.

The velocity due to the action of the wind which prevails in a shaft is modified by friction. This friction varies inversely with the area of the shaft, and in the case of small tubes it forms a very perceptible element of retardation.

Experiments made with tubes 3 inches in diameter tend to show that the velocity obtained in the tube was about $\frac{2}{5}$ of that of the wind; larger diameters on the other hand produce better results.

These results were obtained in a place supplied as far as possible with fresh air to replace that removed, in a manner as far as possible independent of the movement of the atmosphere, and with the top of the tube freely exposed on all sides.

These shafts will very rarely be found to be without action, for the atmosphere is always more or less in movement; and whenever there are currents passing over the top of the shaft an upward current is produced in the shaft.

Inventors frequently maintain that this action of the flue or

shaft is influenced by special forms of cowls. No doubt you must have a top or cover to the shaft to prevent rain coming down; but numerous experiments which have been made by a Committee of The Sanitary Institute tend to show that, with equally sized apertures at the top, an open tube would act best, and that the principal condition in the shape of the top which influences the velocity, under similar conditions of force of wind, is the area of the aperture as compared with the area of the upcast flue.

That is to say, an increase in the area of the aperture of the top, properly regulated as to shape, may, under certain circumstances, produce an increased velocity in the upcast flue; and where a cowl appears to show an increased velocity in an upcast flue, it results from the enlarged area afforded by the cowl as compared with the area of the shaft.

In certain positions where surrounding buildings affect the current, there are forms of cowls which appear to protect the flue from down-draught. But in the majority of cases, it would seem as if intricate forms of cowls serve to diminish the natural effect of the wind; whilst they act in chimneys to impede the escape of the smoke.

These shafts for removing the air must be supplemented by inlets to admit fresh air.

20. Effect of open fires on ventilation of a room.

If you have a fire place with a fire in the grate, the heat of the fire will draw a large volume of air up the chimney, which is of itself a most efficient extracting flue.

Hence every room which possesses an open fire place is furnished with a very powerful engine of ventilation.

But the efficiency of the fire place depends on mechanical force, that is to say, upon the heat developed by the fuel consumed.

The open fire place, by means of the heat which it generates, acts just like a fan or a pump to force or draw the air out of the room. So long as the fire is lighted it is continually at work.

The way in which an ordinary open fire place acts to create circulation of air in a room with closed doors and windows is as follows. The air is drawn along the floor towards the grate; it is then warmed by the heat which pervades all objects near the fire, and part is carried up the chimney with the smoke, whilst the remainder, partly in consequence of the warmth which it has acquired from the fire, and partly owing to the impetus created in its movement towards the fire, flows upwards towards the ceiling near the chimney breast.

It passes along the ceiling, and as it cools in its progress towards the opposite wall, descends to the floor, to be again drawn towards the fire place.

The open fire place thus presents special advantages for securing efficient ventilation by means of the circulation of air which it creates. Up to a certain point it makes the room in which it is in use independent of other means of extraction of air. For instance, a fire place with an ordinary sized flue and a good fire, will extract somewhat above 30,000 cubic feet of air per hour from a room. If the room is crowded the fire will not suffice for ventilation; and, moreover, the degree of vitiation of the air tends to make the fire dull and diminish its efficiency.

The air thus extracted must be drawn into the room from somewhere, and unless arrangements be made for supplying the room with warmed fresh air, cold air finds its way into the room through the special inlets, if any are provided; if not, through the chinks of the windows and doors, or wherever it can get in most easily. There is this objection to the open fire, namely, that the large volume of fresh air required to supply that drawn up the chimney cannot always be warmed with sufficient rapidity by contact with the walls and furniture only; the temperature in different parts of the room is therefore frequently very unequal, and the occupants are subjected to draughts; and if there are two fireplaces in the same room unprovided with special means for the admission of fresh air, one of which is not lighted, the air is often drawn down the vacant chimney.

It is therefore desirable in cold weather to replace some part at least of the air drawn up the chimney by air partially warmed. This can be effected in various ways, either by a service of hot-water pipes carried into all the rooms, to coils placed in front of the fresh air inlets, so as to warm the fresh air as it enters the room; or by bringing warmed air into the room by flues from a central heating apparatus.

The advantage of this latter arrangement is that the air can be brought to the heating apparatus from a pure source, and that it can, if desired, be filtered through jute cloth so as to free it to a great extent from dust.

Where large numbers of persons are to be provided for, especially for instance in schools, some mechanical means of supplying air is absolutely necessary; but in ordinary houses the simplest plan of providing warmed air is to utilise some of the waste heat which, in the case of an ordinary open fire-place, passes away unused up the chimney.

The ventilating fire-place, which has been generally adopted in barracks, was designed with the object of obviating the above-named objections to the common fire-place, and to utilise the spare heat, as well as to provide such adequate means of ventilating the soldiers' rooms in cold weather when the windows are shut, as would not be liable to be deranged.

Fresh air is admitted to a chamber formed at the back of the grate, where it is moderately warmed by a large heating surface, and then carried by a flue, adjacent to the chimney flue, to the upper part of the room, where it flows into the currents which already exist in the room.

Barrack rooms have fireplaces and windows, but these are not sufficient as ventilating appliances in rooms where there are many occupants.

The ventilation is therefore supplemented by Sheringham's valves near the ceiling, and by shafts carried from the ceiling to above the roof.

These shafts have generally been made of wood or brick; for if made of zinc, exposed to the outer air, that part of the action which is due to the excess of the warmth of the air of the room over that of the outer air would be retarded in cold weather.

21. Limits of ventilation without mechanical appliances.

The methods of ventilation which are adequate for barrack rooms would not suffice for places where large numbers are congregated, as, for instance, in large schoolrooms. In these it would be preferable to adopt either a method of forcing in fresh air by means of a fan, or of extracting the air by means of a powerful shaft, and replacing the air thus extracted by fresh air. In a properly devised building the latter would be the most economical arrangement.

With proper arrangements for the supply of fresh air, the purity of the air would be the same in either case. But in our large board schools you may take it as an axiom that you cannot secure adequate ventilation without the application of some mechanical system; and that, in order to obtain the greatest economy in the application of a mechanical system, it is essential that it be made a part of the original design.

This question is, however, somewhat beyond the limits of my present lecture.

There are, however, many points to be considered in connection with this question of simple natural ventilation.

22. Conditions in the atmosphere which may operate to impede artificial arrangements for ventilation.

The action of wind, whilst it tends to exhaust the air through the tube, is, at the same time, acting on all other openings in the building, either to exhaust or to force in air. Hence gusts of wind will sometimes cause a reverse action in the tube, in consequence of some other opening acting temporarily as a means of extraction. The position of rooms in a building materially affects the question of ventilation.

If you have a house with a central staircase from top to bottom, and with a skylight at the top, this will act as a shaft, and being large it is more powerful than smaller shafts, and it will tend to draw air into itself from the rooms, and often counteracts the effect of the chimneys, especially when the

chimneys are cold, or when their size is greater than required for the removal of the air provided for their supply.

In the latter case, a double current, one up, one down, and both sluggish, is sometimes established in the chimney.

A smoky chimney may, therefore, often be cured by being reduced in area, so as to reduce the volume of air required to fill it, or by an adequate provision of fresh air to the room in which it is placed, or by a supply of air in an adjacent hall or staircase.

The effect of a high wind is to diminish the air pressure in a house when all windows are closed on the side of the outer-air pressure: hence, although some of the chimneys may have an accelerated draught due to the velocity of the wind, the action of the air pressure may be to cause others of the chimneys to smoke. The remedy for this would be to open slightly the windows on the side of the air pressure, so as to allow the pressure to act equally through the house.

23. Conditions which should regulate the obtaining of fresh air for ventilating purposes.

It will frequently happen that the open fires in the rooms which require to be fed with fresh air, together with the warm air shaft formed by a central staircase, will combine to draw in the air from every available opening. They will draw up the air from the basement; they will draw it, if they can, from the water-closets and sink-pipes, unless the water-closets and sinks are in projecting buildings cut off by lobbies ventilated from the open air.

For these reasons it is of importance not only to shut off the staircase from the basement, but to provide fresh air to the staircase; and when open fires are used, to supply each room in which there is on open fire-place with its own supply of fresh air. If the temperature of the room is to be kept up to a pleasant heat, this must to some extent be warmed air.

The fresh air should be obtained from places where there are no adjacent sources of impurity; especially not from the vicinity of ash-pits, manure heaps, gully gratings, or other sources of foul air. The inlets from the outer air should be at least two feet from the ground, and the surface near should be paved and sloped away from the inlet, so as to carry off wet rapidly.

It has been estimated that the impurities of town air are very much diminished at 200 yards height, and are not found above 600 yards in height. A London fog will rarely be perceptible at a height of above 100 yards; consequently, to bring pure air into a large town, the simplest way would be to draw it down from a height by means of a high shaft or tower. The Houses of Parliament could be supplied with very much purer air than is now provided for them by bringing the air from the top of the Victoria Tower.

The temperature at which air should be delivered in a room depends somewhat on the temperature of the outer air. With a temperature out of doors of 86°, air delivered at 60° would be felt as too cold. Similarly, in the Arctic expedition, with an out-of-doors temperature — 40° below zero, a temperature of + 40° was felt to be hot.

In this climate the temperature indoors should be maintained at from 50° to 64°, and the warmed inflowing air should not vary much from this temperature; in any case it would not be desirable to exceed from 68° to 70°.

The hygrometric condition of the air must also be considered. If the air is too dry, it may, after it has been warmed, be passed over vessels containing water, to allow it to take up additional moisture—but the natural dampness of an English climate renders this less necessary here than it may be on the continent of Europe, or in Canada and North America where the air is often very dry.

It has not unfrequently happened that complaints of the oppressiveness of dry air artificially warmed have been caused rather by the insufficiency of the supply of warmed air than from its dry condition.

The channels for the admission of air should as a rule be short, direct, and accessible.

Long channels collect dirt, and form a refuge for insects. But if it is necessary to make them long they should be easily accessible for cleaning.

24. Conclusion. In this single lecture I have only had time to give you some general suggestions upon this important subject.

I would, in conclusion, say that it should be accepted as an axiom that by the best ventilating arrangements we can only obtain in our rooms air of a certain standard of impurity: and that ventilating arrangements are only makeshifts to assist in remedying the evils to which we are exposed from the necessity of obtaining an atmosphere in our houses different in temperature from that of the outer air.

To obtain that temperature we sacrifice purity of air; therefore, whenever the outer temperature permits it, windows should be widely opened, so as to replace the air of the room by fresh air as often as possible.

EXAMINATIONS IN SANITARY SCIENCE FOR LOCAL SURVEYORS AND INSPECTORS OF NUISANCES.

BOARD OF EXAMINERS.

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THE great and increasing importance of the duties devolving upon Local Surveyors and Inspectors of Nuisances, in connection with the various Acts relating to Public Health, Drainage and Water Supply, the Sale of Food and Drugs, &c., led the Council of the Sanitary Institute of Great Britain in 1877 to establish Voluntary Examinations, to appoint a Board of Examiners, and to grant Certificates of Competency in Sanitary knowledge.

The Sanitary Institute, in which the older body was incorporated in 1888, is continuing this important work.

The Examinations are arranged in two grades, and are intended to enable Local Surveyors and Inspectors of Nuisances, or persons desirous of becoming such, or of obtaining the Certificate of the Institute, to prove their competency in the subjects of Examination. A register of successful Candidates is kept at the Offices of the Institute, and a copy will be forwarded to Local Boards and Sanitary Authorities on application. Many Boards and Corporations require Candidates, when making applications for appointments, to produce a certificate of this kind.

Up to Dec., 1891, 40 Examinations had been held; 1493 Candidates had been examined, 181 as Local Surveyors, and 1312 as Inspectors of Nuisances; of these 903 passed the Examinations and received Certificates, 78 as Local Surveyors, and 825 as Inspectors.

Examinations in Practical Sanitation and Building, so far as it relates to Sanitary Construction, are held in conjunction with the Worshipful Company of Carpenters.

In order to make the Examinations for Inspectors more accessible to persons residing in the country, the Council have arranged to hold periodical Examinations in the following centres, in addition to the Examinations held in London, provided that at least 20 Candidates send in

applications for Examination:—Newcastle-on-Tyne; Liverpool, Leeds or Manchester; Birmingham or Bristol.

These Examinations in the Provinces will be carried out in the same way as the Examinations in London, and similar Certificates will be granted. It is hoped that later on arrangements may be made for holding them also in Scotland and in Ireland.

Each Examination occupies a portion of two days. On the first day the Examination of Surveyors occupies six hours—viz., usually from 11 a.m. till 2 p.m., and from 3 till 6 p.m., and consists of written papers only. Inspectors of Nuisances have three hours' written Examination on the first day—viz., usually from 11 a.m. to 2 p.m. On the second day the Examination, for each class, usually commences at 11 a.m., and is *vivâ voce*, with one or more questions to be answered in writing, if deemed necessary.

Every Candidate is required to furnish the Board of Examiners with satisfactory testimonials as to age and personal character, and to give two weeks' notice previous to presenting himself for Examination. The fee for Examination must be paid to the Secretary; 10s. 6d. on making application, and the remainder at least one week before the day of Examination. On the receipt of the fee, a ticket will be forwarded admitting to the Examination.

No one under 21 years of age is admitted to the Examinations.

A Certificate of Competency, signed by the Examiners and bearing the Seal of the Institute, is granted to each successful Candidate; but it must be distinctly understood that no Certificate will be granted to any Candidate unless he can write legibly, spell correctly, and possesses a fair knowledge of arithmetic, so that he may be able to prepare a report on any subject connected with his duties, creditable to himself and to the Authority employing him.

The fees payable for the Examination are as follows:—

As Surveyors, £5 5s.

As Inspectors of Nuisances, £3 3s.

But when the Examinations are held in Provincial Towns, £1 1s. extra will be charged to the Candidate in order to cover the expenses incurred in holding an examination out of London.

Unsuccessful Candidates are allowed to present themselves at any other Examination within twelve months on payment of half fees.

The dates of the Examinations for 1892, are as follows:—

For Surveyors—

London—Friday and Saturday, June 17th and 18th.

For Inspectors of Nuisances—

Bristol—Friday and Saturday, March 4th and 5th.
London „ „ April 8th and 9th.
Derby—Thursday and Friday, April 28th and 29th.
Wakefield—Friday and Saturday, June 10th and 11th.
Newcastle— „ „ June 24th and 25th.
Cardiff— „ „ July 8th and 9th.
London— „ „ December 2nd and 3rd.
Liverpool— „ „ December 16th and 17th.

The forms to be filled up before the Examination, by Candidates and by those persons recommending them, will be supplied on application to the Secretary.

SYLLABUS of SUBJECTS for EXAMINATION.

FOR LOCAL SURVEYORS.

(1.) Laws and Bye-Laws—A thorough knowledge of the Acts affecting Sanitary Authorities, as far as they relate to the duties of Local Surveyors; also, of the Model By-Laws issued by the Local Government Board.

(2.) Sewerage and Drainage—The Sanitary arrangements of houses, including internal drainage, the construction of water-closets, privies, and dry-closets, the removal and disposal of refuse; the Sanitary defects of Builder's and Plumber's work; the Sanitary principles of Sewerage and Drainage and their application in the preparation of schemes for, and in the construction of, Sewerage works; the flushing and ventilation of sewers, and the treatment and disposal of sewage.

(3.) Water Supply of Towns and Houses—The sources of water, methods of collecting, purification (filtration, softening, &c.), and distribution. The Sanitary principles of Water Supply, and their application in the preparation of schemes for, and in the construction of, Water-works; the various ways in which water is likely to become polluted, and the best means of ensuring its purity.

(4.) Structural—Regulation of Cellar Dwellings and Lodging Houses, and of Baths and Wash-houses; General principles of Ventilation and their practical application; the amount of air and space necessary for men and cattle; the means of supplying air, and of ensuring its purity.

(5.) Highways and Streets—The Sanitary principles which should be observed in the construction and cleansing of streets and roads.

Candidates will be required to make free-hand sketches.

Any person having passed the above Examination and received the Certificate for Local Surveyor is, by virtue of having such Certificate, upon proposal and election as Member of the Institute, exempt from payment of the Entrance Fee, and will only be called upon to pay the reduced subscription of £1 1s. annually.

FOR INSPECTORS OF NUISANCES.

Duties of Inspectors of Nuisances as defined by the Local Government Board.	Syllabus of Subjects for Examination.
(1.) He shall perform, either under the special directions of the Sanitary Authority, or so far as authorized by the Sanitary Authority, under the directions of the Medical Officer of Health, or in cases where no such directions are required, without such directions, all the duties specially imposed upon an Inspector of Nuisances by the Public Health Act, 1875, or by any other Statute or Statutes, or by the Orders of the Local Government Board, so far as the same apply to his office.	The Provisions of the Acts and Model By-Laws relating to the duties of Inspectors of Nuisances.
(2.) He shall attend all meetings of the Sanitary Authority when so required.	
(3.) He shall by inspection of the District, both systematically at certain periods, and at intervals as occasion may require, keep himself informed in respect of the nuisances existing therein that require abatement.	A knowledge of what constitutes a Nuisance.
(4.) On receiving notice of the existence of any nuisances within the District, or of the breach of any by-laws or regulations made by the Sanitary Authority for the suppression of nuisances, he shall, as early as practicable, visit the spot, and inquire into such alleged nuisance or breach of by-laws or regulations.	Methods of Inspection, of Dwellings, Cellar Dwellings, Dairies, Milk-shops, Markets, Slaughter-houses, Cow-sheds, Canal Boats and Nuisances especially connected with Trades and Manufactories.
(5.) He shall report to the Sanitary Authority any noxious, or offensive businesses, trades, or manufactories established within the District, and the breach or non-observance of any by-laws or regulations made in respect of the same.	
(6.) He shall report to the Sanitary Authority any damage done to any works of water supply, or other works belonging to them, and also any case of wilful or negligent waste of water supplied by them, or any fouling by gas, filth, or otherwise, of water used for domestic purposes.	The Physical Characteristics of good Drinking Water—the various ways in which it may be polluted, by Damage to Supply Works or in Houses, and the means of preventing pollution—Methods of Water Supply.
(7.) He shall from time to time, and forthwith upon complaint, visit and inspect the shops and places kept or used for the preparation or sale of butchers' meat, poultry, fish, fruit, vegetables, corn, bread,	

flour, milk, or any other article to which the provisions of the Public Health Act, 1875, in this behalf shall apply, and examine any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, milk, or any other article as aforesaid, which may be therein; and in case any such article appear to him to be intended for the food of man, and to be unfit for such food, he shall cause the same to be seized, and take such other proceedings as may be necessary in order to have the same dealt with by a Justice: Provided, that in any case of doubt arising under this clause, he shall report the matter to the Medical Officer of Health, with the view of obtaining his advice thereon.

The Characteristics of good and bad Food (such as Meat, Fish, Milk, Vegetables).

(8.) He shall, when and as directed by the Sanitary Authority, procure and submit samples of food, drink, or drugs suspected to be adulterated, to be analysed by the analyst appointed under "The Sale of Food and Drugs Act, 1875," and upon receiving a certificate stating that the articles of food, drink, or drugs are adulterated, cause a complaint to be made, and take the other proceedings prescribed by that Act.

The sale of Food and Drugs' Act.

(9.) He shall give immediate notice to the Medical Officer of Health of the occurrence within the district of any contagious, infectious, or epidemic disease; and whenever it appears to him that the intervention of such officer is necessary in consequence of the existence of any nuisance injurious to health, or of any overcrowding in a house, he shall forthwith inform the Medical Officer of Health thereof.

The Regulations affecting persons suffering or recovering from Infectious diseases, and some knowledge of such diseases—The principles of Ventilation, and simple methods of Ventilating Rooms—Measurement of Cubic Space.

(10.) He shall, subject to the directions of the Sanitary Authority, attend to the instructions of the Medical Officer of Health with respect to any measures which can be lawfully taken by an Inspector of Nuisances under the Public Health Act, 1875, or under any other Statute or Statutes, for preventing the spread of any contagious, infectious, or epidemic disease of a dangerous character.

Disinfectants and Methods of Disinfection.

(11.) He shall enter from day to day, in a book to be provided by the Sanitary Authority, particulars of his inspections and of the action taken by him in the execution of his duties. He shall also keep a book or books, to be provided by the Sanitary Authority, so arranged as to form, as far as possible, a continuous record of the sanitary condition of each of the premises in respect of which any action has been taken under the Public Health Act, 1875, or under any other Statute or Statutes, and shall keep any other systematic records that the Sanitary Authority may require.

(12.) He shall at all reasonable times, when applied to by the Medical Officer of Health, produce to him his books, or any of them, and render to him such information as he may be able to furnish with respect to any matter to which the duties of Inspector of Nuisances relate.

A Knowledge of the General Duties of the Office, and Methods of keeping the necessary Books and Records. Writing and Spelling.

(13.) He shall, if directed by the Sanitary Authority to do so, superintend and see to the due execution of all works which may be undertaken under their direction for the suppression or removal of nuisances within the district.

The proper conditions of good Drainage—The advantages and disadvantages of various Sanitary Appliances for Houses—Inspection of Builder's and Plumber's work—Scavenging and the Disposal of Refuse.

(14.) He shall, if directed by the Sanitary Authority to do so, act as Officer of the said Authority as Local Authority under the Contagious Diseases (Animals) Act, 1886, and any Orders or Regulations made thereunder.

(15.) In matters not specially provided for in this Order, he shall observe and execute all the lawful orders and directions of the Sanitary Authority, and the Orders of the Local Government Board which may be hereafter issued, applicable to his office.

Any person having passed the above Examination and received the Certificate for Inspectors of Nuisances is, by virtue of having such Certificate, upon proposal and election as Associate of the Institute, exempt from payment of the Entrance Fee, and will only be called upon to pay the reduced subscription of 10s. 6d. annually.

Particulars as to Local Boards requiring Candidates to hold Certificates.

APPOINTMENT OF INSPECTORS OF NUISANCES. SANITARY QUALIFICATIONS.

For several years past it has been the practice of many Local Authorities to insert in their advertisements for Inspectors of Nuisances clauses similar to the following, or otherwise to definitely recognise the desirability of a Certificate:—

Extracts from advertisements—

POPLAR DISTRICT.

" . . . Candidates must possess a knowledge of building construction, and if not already in possession of the Certificate of The Sanitary Institute, must obtain such Certificate within twelve months of appointment. . . . "

PADDINGTON PARISH.

" . . . Applicants must have passed a satisfactory examination and be in possession of Certificates from The Sanitary Institute. . . ."

SHEFFIELD.

" . . . Candidates must hold the Certificate of The Sanitary Institute. . . ."

The following are some of the Towns and Parishes which have adopted this practice, with the dates of their several advertisements:—

METROPOLITAN—26.

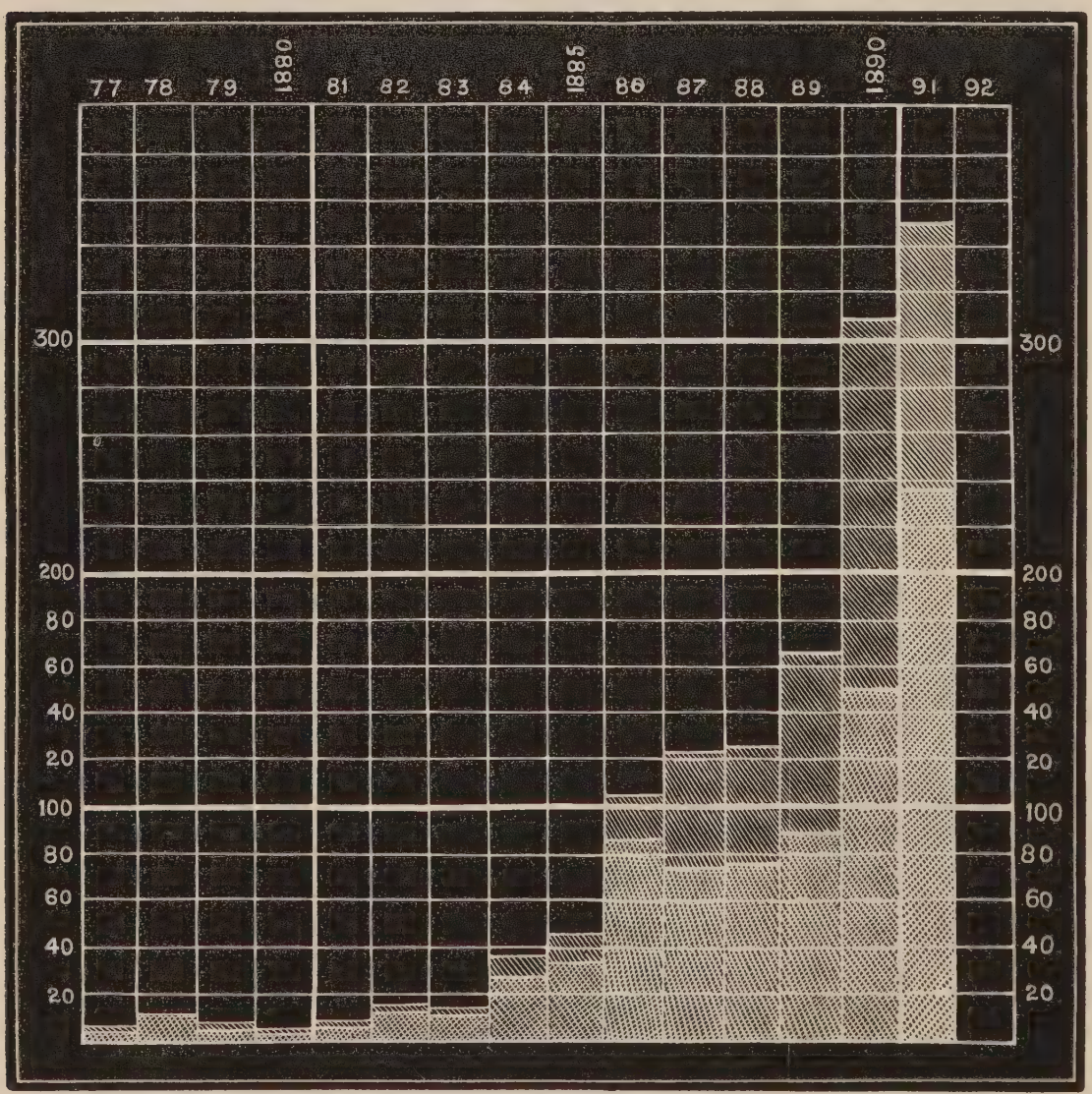
City of London, 1891
Battersea, 1885—89—91.
Bethnal Green, 1889—90.
Camberwell, 1891.
Fulham, 1890—90.
Greenwich, 1890—91.
Hackney, 1891.
Hammersmith, 1891.
Hampstead, 1891—92.
Kensington, 1891.
Lambeth, 1890.
Limehouse, 1890.
Marylebone, 1891.
Newington, 1891.
Paddington, 1884—89.
Poplar, 1890.
St. George's, Hanover Square, 1891.
St. James's, Westminster, 1891.
St. Luke's, 1887—91.
St. Margaret, Westminster, 1892.
St. Mary, Islington—1892.
St. Olave's, 1889.
St. Pancras, 1885—87—90—92.
St. Saviour's, 1889.
Wandsworth (4), 1888—89—91.
Whitechapel, 1891.

PROVINCIAL—63.

Barnet, 1890.
Bath, 1890.
Battle, 1890.
Bedwelty, 1891.
Birkenhead, 1891.
Blackpool, 1889.
Blean, 1890.
Bournemouth, 1891—91.
Bradfield, 1891.
Brierley Hill, 1890—91.
Bristol, 1884—86.
Bromley, Kent, 1891—91.
Cardiff, 1890—91.
Carlisle, 1890.
Carnarvon, 1891.
Chiswick, 1891.
Coventry, 1891.
Croydon, 1891.
Darwen, 1891.
Dewsbury, 1886—90.
Eastbourne, 1889.
Ely, 1888.
Exeter, 1889.
Foleshill, 1891.
Hailsham, 1886—91.
Hanley, 1891.
Hartlepool, 1890.
Kingston-upon-Hull, 1884—90—90.
Leeds, 1889.
Liverpool, 1886—91.
Lytham, 1887.
Maidstone, 1889—89.
Manchester, 1890—91.
Margate, 1888—90.
Milton-by-Sittingbourne, 1887.
Nantyglo, 1891.
Nelson, 1892.
Newcastle-on-Tyne, 1891.
Newmarket, 1887-88-90.
Norwich, 1892.
Oswestry, 1887.
Pontypridd, 1890.
Portsmouth, 1890.
Rhyl, 1890.
Salford, 1891.
Scarborough, 1888.
Sheffield, 1890—91.
Southampton, 1890—91.
Stockport, 1891.
Stockton, 1887-89-90-91.
Sunderland, 1885.
Tendring, 1891.
Thakeham, 1890—90.
Twickenham, 1887.
Wakefield, 1891.
Ware, 1891.
Watford, 1887.
West Ham, 1891.
Wigan, 1891.
Willesden, 1891.
Wimbledon, 1890.
Worthing, 1890—91.
Yorkshire, W.R., 1891.

Table shewing the number of Candidates examined and certified each year; and Diagram relating to the Inspectors' Examination only.

Year.	Number Examined.			Certificated.				
				Number.			Per cent. of Total.	
	Surveyor	Inspector	Total.	Surveyor	Inspector	Total.	Surveyor.	Inspector.
1877	3	5	8	2	3	5	*67*	*60*
1878	11	10	21	3	10	13	*27*	*100*
1879	4	6	10	2	4	6	*50*	*67*
1880	10	3	13	6	2	8	*60*	*67*
1881	7	7	14	2	6	8	*29*	*86*
1882	6	15	21	3	13	16	*50*	*87*
1883	7	13	20	3	11	14	*43*	*85*
1884	14	36	50	7	27	34	*50*	*75*
1885	20	44	64	5	33	38	*25*	*75*
1886	19	105	124	9	86	95	*47*	*82*
1887	17	122	139	7	75	82	*41*	*61*
1888	25	124	149	8	77	85	*32*	*62*
1889	9	165	174	5	89	94	*56*	*54*
1890	18	307	325	8	151	159	*44*	*49*
1891	11	350	361	8	238	246	*73*	*68*
	181	1312	1493	78	825	903	*43*	*63*



NOTE.—*The total number of Candidates is shown by the whole height of the column shaded, and the number who have obtained Certificates by the lighter portion.*

CANDIDATES WHO RECEIVED CERTIFICATES DURING 1891.

LOCAL SURVEYORS.

1891, June 6. Felkin, Howard Riley, *Vestry Hall, Hammersmith.*
1891, June 6. Flower, Thomas James Moss, *Liverpool Chambers, Corn Street, Bristol.*
1891, June 6. Gibbs, Arthur Gordon, *The Square, Storrington, Pulborough.*
1891, June 6. Graves, Matthew Dodgson, 7½, *College Street, York.*
1891, June 6. Hills, Harry James, 27, *Park Road, New Wandsworth, S.W.*
1891, June 6. Kay, Walter Robert, *Mount Sion House, Bury, Lancashire.*
1891, June 6. Morley, Edwin, *Town Hall, Walthamstow.*
1891, June 6. Saise, Alfred John, *Fishponds, Bristol.*

INSPECTORS OF NUISANCES.

1891, Dec. 19. Adams, Richard, 294, *The Borough Road, Birkenhead.*
1891, Apr. 11. Addison, Scott, 15, *Mostyn Road, Bow, E.*
1891, Dec. 5. Andrews, Daniel James, *Court House, Marylebone.*
1891, Dec. 5. Anthony, Frederick Joseph, 33, *Yatton Street, Bromley-by-Bow.*
1891, Dec. 19. Ashworth, James H., 5, *Catherine Street, Lees, near Oldham.*
1891, Dec. 5. Athey, Frederick, 47, *Penge Road, South Norwood.*
1891, Dec. 5. Atkins, Robert William, 32, *Holmwood Road, South Norwood.*
1891, Dec. 5. Ayliffe, Charles William L., *Vine Cottage, Ascot.*
1891, Dec. 5. Bailes, Christopher John, 6, *Albert Street, Newcastle-on-Tyne.*
1891, Dec. 5. Bailey, Robert, *Northchurch, Berkhampstead.*
1891, Dec. 5. Baker, William Kirkham, *Infectious Hospital, Mill Road, Cambridge.*
1891, June 27. Barker, John, *Princess Street, Corbridge-on-Tyne.*
1891, Aug. 29. Barrett, George William, *Brownhills, Walsall.*
1891, Apr. 11. Bazley, James, 16, *Sandford Street, Exeter.*
1891, Aug. 29. Beech, James, *Ivy Cottage, Brownhills, Tunstall.*
1891, Apr. 11. Bland, John S., 46, *Palmer Street, Blackburn.*
1891, Feb. 14. Bourne, Edward, 256, *High Street, Cheltenham.*
1891, Feb. 14. Boyd, James M., 41, *English Street, Dumfries.*
1891, June 27. Brook, Joseph, Jun., 121, *Park Hill Road, Liverpool.*

1891, Feb. 14. Brown, George William, 3, *Marle Hill Villas, Cheltenham.*
1891, Aug. 29. Brown, Robert Pinning, 3, *Cane Hill Villas, Purley, Surrey.*
1891, Dec. 5. Bryan, Joseph James, 20, *Thornhill Square, Barnsbury.*
1891, Apr. 11. Bubb, John Thomas, 38, *Albert Park, Bristol.*
1891, Dec. 19. Buckley, Harry, *Alma Terrace, Strines, near Stockport.*
1891, Aug. 29. Burgess, Charles, *Burslem.*
1891, Dec. 19. Burslam, Randle, *Town Hall, Congleton.*
1891, Dec. 5. Buxton, Edmund, *Mayfield, Ashbourne.*
1891, Dec. 19. Carr, William Henry, 12, *West Street, Nelson, Lancashire.*
1891, Apr. 11. Carter, Alfred, 71, *Leighton Road, Kentish Town.*
1891, Apr. 11. Cary, Aquilla S., 8, *Brunswick Crescent, Brunswick Park, New Southgate, N.*
1891, Apr. 11. Cass, Robert William, 19, *Brunswick Road, St. George's Road, Hull.*
1891, Dec. 5. Cave, James, *Town Hall, Kensington.*
1891, Aug. 29. Chapman, John James, *Stone, Staffordshire.*
1891, Dec. 5. Chappell, William, 96, *Grove Road, Holloway.*
1891, Aug. 29. Cheshire, Alfred, 64, *Church Street, Rugeley.*
1891, June 27. Clark, William, Jun., 53, *John Clay Street, South Shields.*
1891, Apr. 11. Clarke, John Henry, 5, *Fyfield, Andover, Hants.*
1891, Dec. 5. Clarke, Robert Edwyn, 5, *Gibson Square, N.*
1891, Dec. 19. Coles, John Thomas, 18, *St. George's Road, Winsford, Cheshire.*
1891, Apr. 11. Collins, Henry Beale, m.r.c.s., l.s.a., 16, *Little Grosvenor Street, W.*
1891, Aug. 29. Collyer, John, *Uttoxeter, Staffordshire.*
1891, Dec. 5. Cook, Alfred, 100, *Frampton Park Road, Hackney.*
1891, June 27. Cook, James, *Warton, near Carnforth.*
1891, Dec. 5. Corby, Thomas, 13, *Rochester Road, Camden Road, N.W.*
1891, Dec. 19. Corcoran, Bernard, *Foregate Street, Stafford.*
1891, Apr. 11. Corp, James, 16, *Harrington Square, N.W.*
1891, Aug. 29. Coney, William Henry, *Holyhead Road, Wednesbury.*
1891, Aug. 29. Cottle, Arthur Thomas, *Selly Oak, near Birmingham.*
1891, Dec. 19. Coupe, Edward, 14, *Royle Road, Chorley.*
1891, Dec. 19. Cowden, David Bartley, *Anfield Cemetery, Anfield, Liverpool.*
1891, Dec. 5. Crabbe, Walter George, 44, *St. Lawrence Road, Brixton.*
1891, Apr. 11. Crane, Joseph, 93, *Trafalgar Road, Gorleston, Gt. Yarmouth.*
1891, Dec. 19. Cruden, John, *Berwick-upon-Tweed.*

1891, Apr. 11. CULLING, JAMES GEORGE, *Swaffham, Norfolk.*
1891, Apr. 11. CURTIN, WILLIAM HENRY, 12, *Studley Avenue, Holderness Road, Hull.*
1891, Apr. 11. DALE, DUNCAN, 312, *Camberwell New Road, S.E.*
1891, Apr. 11. DAWSON, JOHN MARSHALL, 93, *Malpas Rd., Brockley, S.E.*
1891, Apr. 11. DOCKING, FREDERICK REYNOLDS, *Oak Lodge, Beddington Lane, Mitcham.*
1891, June 27. DOWSING, ALFRED, *Mawneys Road, Romford, Essex.*
1891, Apr. 11. DRAKE, JOHN, 2, *Gloucester Road, Teignmouth.*
1891, June 27. DRYDEN, JOSEPH, 13, *Cardigan Street, Stockton-on-Tees.*
1891, Aug. 29. DUTHIE, ALEXANDER, 93, *High Street, Brechin.*
1891, Apr. 11. DYKE, ALFRED WILLIAM, *St. John's Wharf, Wandsworth Bridge, Fulham.*
1891, Apr. 11. EARWICKER, JOHN CHARLES, 3, *Clarence Terrrce, St. Mary's Grove, Richmond, Surrey.*
1891, Aug. 29. ECCLES, WILLIAM HENRY, 98, *Kay Street, Darwen.*
1891, Dec. 19. FELTON, WILLIAM, *Underhill Cottage, Oswestry.*
1891, Dec. 19. FOSTER, THOMAS, 39, *Bradford Road, Otley, Yorks.*
1891, Aug. 29. FYLES, JOHN, *Local Board, Smethwick, Birmingham.*
1891, Dec. 5. GAMMANS, DAVID, 68, *Duncan Road, Southsea.*
1891, Dec. 19. GERRARD, JOHN, 43, *Woolton St., Woolton, Liverpool.*
1891, Aug. 29. GILES, JOHN C., *Dennis Lodge, Brettel Lane, Stourbridge.*
1891, Apr. 11. GILLESPIE, REV. CHARLES GEORGE KNOX, 2, *Darwin Terrace, Derby.*
1891, Dec. 19. GRIFFIN, GEORGE FREDERICK AUGUSTUS, *Nottingham Road, Mansfield, Notts.*
1891, Dec. 5. GOATES, JOHN PERCY, 16, *Great Newport Street, Charing Cross Road.*
1891, Feb. 14. GODSALL, HENRY JOHN, *Local Board Offices, Park Road, Saltley, Birmingham.*
1891, Aug. 29. GOODALL, SAMUEL ARTHUR, 109, *Raglan Street, Fenton.*
1891, Dec. 5. GOODMAN, HERBERT, 4, *Clapton Common, N.E.*
1891, Dec. 5. GORNIOT, THOMAS, 98, *Bingfield Street, King's Cross.*
1891, Apr. 11. GRAY, HERBERT GEORGE, 16, *Timpson Street Portsmouth.*
1891, Apr. 11. GREEN, EDWARD ALBERT, 16, *Rock Street, Sheffield.*
1891, Apr. 11. GRIVELL, ELIAS JAMES, 10, *Salisbury Rd., Gloucester.*
1891, Feb. 14. HANSON, JOHN H., *Laughton, Gainsborough.*
1891, Apr. 11. HARDY, GEORGE HURLSTONE, *Park Rd., Twickenham.*
1891, Feb. 14. HARPER, FRANK, 39, *Derby Road, Northampton.*
1891, Apr. 11. HARRIS, GEORGE, 11, *Holly Park Terrace, New Southgate, N.*
1891, June 27. HATTON, CHARLES, 24, *Church Street, Hereford.*
1891, June 27. HEAPS, WILLIAM, Jun., 28, *Parker Street, Chorley.*
1891, Dec. 19. HEBDEN, JOSEPH HENRY, 1, *Eton Street, Hessle Road, Hull.*

1891, Apr. 11. HENWOOD, JOHN HENRY, 252, *Crystal Palace Road, S.E.*
1891, June 27. HERBERT, HARRY, 3, *Charge Place, Stockton-on-Tees.*
1891, Dec. 5. HIGH, GEORGE FREDERICK, 28, *Clifden Road, Lower Clapton.*
1891, Dec. 5. HOGBIN, LEONARD WILLIAM, *Victoria House, Herne Bay, Kent.*
1891, Dec. 5. HORLOCK, CHARLES WILLIAM, *Little Horsted, Uckfield, Sussex.*
1891, June 27. HORNER, BENJAMIN ROPER, *Town Hall, Bradford.*
1891, June 27. HORSMAN, CHARLES EDWIN, 8, *Bedford Square, Bishopwearmouth, Sunderland.*
1891, Dec. 5. HORTON, RICHARD, 46, *Royal Avenue, Chelsea.*
1891, Aug. 29. HOWELL, EDWARD WILLIAM, *Stoke-upon-Trent.*
1891, Aug. 29. HUGHES, WALTER, *Thompson Street, Bilston.*
1891, Apr. 11. HYSLOP, JAMES, 18, *New Park Street, Blackburn.*
1891, Dec. 5. INGHAM, JOHN WILLIAM, 1, *Buxton Terrace, Chichester Road, Leytonstone.*
1891, Aug. 29. INSKIP, FREDERICK THOMAS, *Dilhorn, Stoke-on-Trent.*
1891, Dec. 19. IRVING, WILLIAM, *Local Board Offices, Wigton, Cumberland.*
1891, Dec. 19. JACKSON, JAMES, *Town Hall, Huddersfield.*
1891, June 27. JACKSON, WILLIAM, *Local Board Offices, Ramsbottom.*
1891, June 27. JARVEY, GEORGE, *Town Hall, Salford.*
1891, June 27. JOHNSON, MATTHEW, 31, *Palmer Street, Jarrow.*
1891, Dec. 5. KENNEDY, DANIEL, 19, *Tremlett Grove, Junction Road, N.*
1891, Apr. 11. KERSHAW, EDWARD BAXTER, 115, *Wellfield Road, Streatham.*
1891, Apr. 11. KING, ALBERT SYDNEY WATERLOW, 27, *Solon Road, Brixton.*
1891, Dec. 5. KING, RICHARD WILSON, 197, *Stanhope Street, Newcastle-on-Tyne.*
1891, June 27. KIRK, WILLIAM HUGH, *Town Hall, Newcastle-on-Tyne.*
1891, Apr. 11. LAIRD, JAMES CAMPBELL, 3, *Emma Street, Blairgowrie, N.B.*
1891, Aug. 29. LASKEY, CARLOS WILLIAM, 33, *Enbridge Street, Salford.*
1891, Dec. 5. LAWRENCE, CHARLES, 35, *Reedham Street, Choumert Road, Peckham.*
1891, June 27. LEAR, CHAS. FRANK E., *Alverstoke, Gosport, Hants.*
1891, Dec. 19. LEIGH, FREDERICK GEORGE, *The Sanitorium, Whiston, Prescot.*
1891, Dec. 5. LEWIS, FRED. JOHN, 64, *Clifton Hill, N.W.*
1891, Apr. 11. LEWIS, SETH, *Sanitary Office, Stockport.*
1891, Apr. 11. LLOYD, CHRISTOPHER, 2, *St. Mark's Terrace, New Brompton, Kent.*
1891, Apr. 11. LOCKE, WALTER RICHARD, 13, *Great Percy Street, W.C.*

1891, Aug. 29. Lowry, John, *Bradmore, Wolverhampton.*
1891, Aug. 29. Lowry, Thomas Augustus, *Bradmore, Wolverhampton.*
1891, Apr. 11. Mackie, Adam, 23, *Thomas Street, Woolwich.*
1891, Aug. 29. Madin, William B., *Town Hall, Leek.*
1891, Apr. 11. Mager, Frederick Walter, 11, *Quiet Street, Bath.*
1891, Dec. 5. Malvern, Thomas, *Winchcomb Street, Cheltenham.*
1891, Dec. 19. Marriott, James, *Town Hall, Salford.*
1891, June 27. Marsden, William Edward, 13, *Springfield Street, Darwen.*
1891, Dec. 19. Martin, Robert, 17, *Wawne Street, Spring Bank, Hull.*
1891, Apr. 11. Martin, William, Jun., *Glenburn, Carluke, N.B.*
1891, Dec. 19. Matthew, Frederick, *Kedleston, Derby.*
1891, Dec. 5. Matthews, Demas Walter, 103, *Kidd Street, Woolwich.*
1891, Dec. 5. Maxwell, William Henry, *Victoria House, Locksbrook, Bath.*
1891, Dec. 19. Metcalf, John, 14, *Athol Road, Sunderland.*
1891, Dec. 5. Middleton, Haydn, 15, *Gray Street, Barnsbury.*
1891, June 27. Miller, Henry, *The Wilderness, Norwich.*
1891, Dec. 5. Mills, Joshua George, *North Road, West Kirby, Cheshire.*
1891, Apr. 11. Milner, Walter, 40, *Sackville Street, Piccadilly.*
1891, Dec. 5. Mitchell, Thomas, 34, *Munster Square, Euston Road, N.W.*
1891, Dec. 5. Monk, Albert Thomas, 98, *King Street, Woolwich.*
1891, Apr. 11. Morgan, William, *Bryncadler, Pontyclown, Glamorgan.*
1891, Feb. 14. Morris, Griffith John, *Garden Vale, Athlone, Ireland.*
1891, Aug. 29. Moss, Samuel, *Williamson Street, Tunstall.*
1891, Dec. 5. Newman, Reginald William, *Cator Estate Office, Beckenham.*
1891, Aug. 29. Nicklin, Joseph, *Rowley Regis, Stafford.*
1891, Dec. 5. Norman, Ernest William, 4, *Albany Terrace, Forest Gate, E.*
1891, Aug. 29. Nuttall, Ellis, 4, *Oak Street, Rawtenstall.*
1891, Dec. 19. Orrell, Thomas, *Carr Cottage, Threlkeld, near Keswick.*
1891, June 27. Outram, Mason, *Mill House, Dronfield, Sheffield.*
1891, Apr. 11. Paramor, Robert Walter, 16, *Randolph Gardens, Dover.*
1891, Dec. 5. Parsley, Frederick William, 200, *Marylebone Road, W.*
1891, Aug. 29. Payne, Thomas, *Hill Top, Warley, Oldbury.*
1891, Apr. 11. Peake, Thomas Jones, 61, *Wybunbury Road, Willaston.*
1891, Apr. 11. Pemberton, Oliver, 273, *Wheeler Street, Birmingham.*

1891, Dec. 5. POLLARD, EDWARD, *Pioneer Lodge, Church Road, Leyton.*
1891, June 27. POOL, FRED, 3, *Convent Lane, Anlaby Road, Hull.*
1891, Apr. 11. POWELL, CHARLES JENNINGS, 1, *Mountrath Street, Walsall.*
1891, Dec. 5. POWELL, WILLIAM ARTHUR, 27, *Endymion Road, Finsbury Park.*
1891, Aug. 29. PRATT, RICHARD CHARLES, Jun., 2, *Whycliffe Road, Purley, Surrey.*
1891, Aug. 29. PRICE, JOHN, 29, *Elliot Street, Newcastle, Staffordshire.*
1891, Dec. 19. PRIESTLEY, JOHN A., *Ash Cottage, Grange Lane, Accrington.*
1891, Dec. 5. REAVELL, FRANK NOBLE, *Maybank Road, Woodford.*
1891, June 27. RICHARDS, ISAAC JOHN, *Town Hall, Gateshead.*
1891, Dec. 5. ROBERTS, DAVID MORRIS, *Berlin House, High Street, Portmadoc.*
1891, Dec. 19. ROBSON, LANCELOT, 12, *Stockton Street, West Hartlepool.*
1891, Apr. 11. ROE, EDWARD CHARLES, Jun., *Maswell Park, Hounslow.*
1891, Apr. 11. ROSSITER, ROBERT HERBERT, 15, *Sloane Terrace, S.W.*
1891, June 27. ROWLAND, ARTHUR, 5, *Cambridge Street, Hull.*
1891, June 27. SALMON, JAMES, 1, *Montrose Street, Glasgow.*
1891, Aug. 29. SALT, SAMUEL, *Town Hall, Hanley.*
1891, June 27. SEINOR, JOHN SIDNEY, 3, *Queen's Road, Gosport.*
1891, Dec. 5. SHAPLEY, WILLIAM G., 37, *Copeland Road, Peckham.*
1891, Aug. 29. SHAW, JOE HENRY, *Brownhills, Walsall.*
1891, Apr. 11. SHEPHERD, WALLACE JOHN, 13, *Bellfields Road, Brixton.*
1891, Dec. 5. SHILL, ALBERT EDMUND, 30, *Dayton Grove, Peckham.*
1891, Aug. 29. SHUFFLEBOTHAM, WILLIAM, *Roche House, Weston Street, Leek, Staffordshire.*
1891, Dec. 19. SHUTTLEWORTH, WILLIAM, *Town Hall, Salford.*
1891, Dec. 19. SIDDALL, JOSEPH, *Stalybridge Road, Ashton-under-Lyne.*
1891, Apr. 11. SIMMONS, EDWARD JOHN, 80, *Paulet Road, Camberwell.*
1891, Dec. 5. SIMMONS, THOMAS, 50, *Victor Road, Seven Sisters Road, N.*
1891, June 27. SIMPSON, ROBERT, 16, *Dobing Street, Stockton-on-Tees.*
1891, Dec. 5. SIMPSON, ROBERT DAVID JAMES, *Board of Works, Deptford.*
1891, Apr. 11. SINGLETON, THOMAS, 19, *Randolph Street, Camden Town, N.W.*
1891, Dec. 5. SLATER, HERBERT, 24, *Bond Street, Leeds.*
1891, Dec. 5. SMITH, GEORGE, 15, *St. Anne's Terrace, St. John's Wood, N.W.*
1891, Apr. 11. SMITH, JAMES, 7, *Park Street, Macclesfield.*

1891, Dec. 19. Smith, John, 39, *Makin Road, Attercliffe, Sheffield.*
1891, Apr. 11. Smith, Warren Boden, 68, *College Street, Chelsea.*
1891, Apr. 11. Stanley, Walter, 67, *Derringham Street, Hull.*
1891, Dec. 5. Stannard, Harry William, *Market Place, Rugby.*
1891, Dec. 5. Stansfeld, Alfred, 2, *Tokenhouse Buildings, E.C.*
1891, Aug. 29. Steward, James, 14, *Clarence Place, Whitby.*
1891, Dec. 5. Streather, William Turner, 4, *Lismore Road, Gospel Oak, N.W.*
1891, Dec. 5. Sullivan, James Walter, *Vestry Offices, Battersea Rise.*
1891, Dec. 5. Sumner, Frank, 17, *Kingsley Road, Kilburn, N.W.*
1891, Apr. 11. Sumner, John, 15, *Windsor Street, Wigan.*
1891, Apr. 11. Switzer, Sidney, 9, *Derby Street, Gray's Inn Road.*
1891, June 27. Sykes, Walter Morton, *Gill House, Ulverston.*
1891, June 27. Tate, Robert W., 98, *Howard Street, North Shields.*
1891, Aug. 29. Taylor, Harry William, *Ibstock, Ashby-de-la-Zouch.*
1891, Apr. 11. Thatcher, Albert Geo. Hendy, *Hampton Court Palace, Kingston.*
1891, Apr. 11. Thompson, Ralph, *Hall Stile Bank, Hexham.*
1891, Dec. 19. Tindell, Robert L., *Municipal Offices, Leeds.*
1891, Dec. 5. Titmuss, Joseph E., 8, *Sidney Terrace, Winkfield Road, Wood Green.*
1891, Aug. 29. Tomkys, Frank Law, *Borough Surveyor's Office, Yeovil.*
1891, Dec. 19. Tomlinson, Frank, 59, *Sheriff Street, Rochdale.*
1891, Dec. 5. Toms, William Charles, 14, *Evandale Rd., Brixton.*
1891, Dec. 5. Townsend, John Walter, "*Wedreda,*" *Wimbledon.*
1891, Apr. 11. Toynbee, William Samuel, 24, *Lorne Terrace, Greenwich.*
1891, Apr. 11. Turner, William Henry, 7, *Wheatstone Road, Southsea, Portsmouth.*
1891, Apr. 11. Vincent, George Edwards Bussell, 49, *Huntingdon Street, Kingsland Road, N.*
1891, Dec. 5. Walden, Robert Henry, "*Chandos,*" *Drummond Road, Bournemouth.*
1891, Dec. 5. Wall, Samuel Edward, 26, *Mount View Road, Stroud Green, N.*
1891, Dec. 19. Ward, Horace Tempest, 89, *Woodroyd Road, West Bowling, Bradford.*
1891, Dec. 5. Watson, Harry John, 5, *Upper John Street, Golden Square, W.*
1891, Dec. 19. Watson, Thomas, *Kirkoswald, Cumberland.*
1891, June 27. Weatheritt, James, *Town Hall, Newcastle-on-Tyne.*
1891, June 27. Webb, Albert Edward, 154, *Sultan Road, Portsmouth.*
1891, Dec. 5. West, John, 118, *Leathwaite Rd., Clapham Common.*
1891, Dec. 5. Whitelaw, Charles Edward, 9, *Selborne Terrace, Fratton, Portsmouth.*
1891, Dec. 19. Whitham, Joseph, *Shelf, Halifax.*

1891, Apr. 11. WHITTOME, PHILIP ALFRED, *The Chestnuts, Rothesay Road, Bedford.*
1891, Apr. 11. WILDE, ALFRED JAMES, *Mill Road, Cleethorpes, Lincolnshire.*
1891, Dec. 19. WILLIAMS, GEORGE, Jun., 6, *Priory Road, Everton, Liverpool.*
1891, Dec. 5. WILLIAMS, JOSEPH, 30, *Goldhurst Terrace, Finchley Road, N.W.*
1891, Dec. 19. WILLIAMS, RICHARD, Jun., 14, *Lucerne Street, Lark Lane, Sefton Park, Liverpool.*
1891, Dec. 5. WILSON, JOHN FAIRWEATHER, *London County Council, Spring Gardens, S.W.*
1891, Dec. 19. WOOD, ALFRED, 6, *Eldon Street, Bury.*
1891, Aug. 29. WOODESON, WILLIAM, 1A, *Charles Street, Pendleton, Manchester.*
1891, Dec. 5. WOODMAN, HENRY FREDERICK, 18, *Burlington Road, Westbourne Park.*
1891, Dec. 19. WOODS, HENRY THOMAS, 5, *Newton Street, Millom.*
1891, Dec. 5. WOODS, HERBERT D'LIMA, 11, *Buckley Road, Kilburn, N.W.*
1891, Apr. 11. WORRALL, ERNEST, 64, *Rappart Road, Seacombe.*
1891, Aug. 29. WORRALL, WILLIAM HENRY, 208, *High Street, Harborne.*
1891, Dec. 5. WORSLEY, ARTHUR HENRY, *Public Offices, Dyne Road, Kilburn.*
1891, Dec. 5. YATES, ROBERT, 42, *Lucas Street, Pimlico.*
1891, Dec. 5. YOUNG, FRANK RUSSELL, 18, *Palmerston Road, Walthamstow.*
1891, Dec. 5. YOUNG, ISAAC, 3, *Spencer Street, Park Rd., Battersea.*

CONTRIBUTIONS TO THE LIBRARY DURING 1891.

In addition to the works enumerated in the following list, valuable donations of back numbers of Reports, and other official publications have been received from Prof. W. H. Corfield (84 vols.), and The Royal Meteorological Society (50 vols.).

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——— *Canadian Institute.* The Transactions, Vol. I., Part I. & II. 139 p. & 164 p., 8vo. Toronto, 1890 & 1891. *The Institute.*

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——— *Medical Department.* Nineteenth Annual Report of the Local Government Board, 1889-90. Supplement containing Report of Medical Officer for 1889. 250 p., 8vo. London, 1890.

——— Dr. Barry's Report upon the Sanitary circumstances of the Lepton Urban Sanitary District, and upon Administration by the Sanitary Authority. 13 p., f. cap.

——— Dr. Barry's Report upon the Sanitary circumstances of the Kirkheaton Urban Sanitary District, and upon Administration by the Sanitary Authority. 13 p., f. cap.

Local Government Board. Dr. Barry's Report upon the Sanitary circumstances of the Hepworth Urban Sanitary District, and upon Administration by the Sanitary Authority. 16 p., f. cap.

——— Dr. Barry's Report upon the Sanitary circumstances of the Cumberworth Urban Sanitary District, and upon Administration by the Sanitary Authority. 10 p., f. cap. London, 1891.

——— Dr. Barry's Interim Report to the Local Government Board on an Epidemic Prevalence of Enteric Fever in several towns situate in the Valley of the River Tees, in South Durham and North Yorkshire. 11 p., f. cap. London, 1891.

——— Dr. Blaxall's Report upon the Sanitary Condition and Administration of the Rural Sanitary District of Staines, Middlesex. 10 p., f. cap. London, March, 1891.

——— Dr. Bruce Low's Report on some localised occurrences of Cerebro-spinal Meningitis in certain parishes of the Eastern Counties. 9 p. London, February, 1891.

——— Dr. Bruce Low's Report on a Prevalence in certain localities of Northamptonshire of Anomalous illnesses characterised by Pneumonia, and sometimes by Meningeal symptoms, and frequently associated with Tonsilitis or Sore Throat. 12 p., f. cap. London, 1891.

——— Dr. Bruce Low's Report on the Sanitary State of Raunds, in the Thrapston Rural Sanitary District, and on the administration by the Sanitary Authority. 4 p., f. cap. London, 1891.

——— Joint Report by Dr. Barry and Mr. P. Gordon Smith on Back-to-back Houses. 55 pages, f. cap. London, 1888.

——— Dr. Parsons' Report on the Sanitary Condition of Foleshill Rural Sanitary District, in reference to the Prevalence of Enteric Fever therein. 11 p., f. cap. London, 1891.

——— Dr. Parsons' Report on the Influenza Epidemic of 1889-90. 324 p., 8vo. London, 1891.

——— Mr. Spear's Report upon the Sanitary Condition and Administration of the Pembroke Rural Sanitary District, and upon the question of the proposed acquisition of Bye-Laws for the Parish of Llanstadwell. 3 p., f. cap. London, November, 1890.

——— Mr. Spear's Report to the Local Government Board on the Sanitary Condition of the Wells Urban Sanitary Districts, Norfolk. 4 p., f. cap.

——— Mr. Spear's Report on the Fatal Prevalence of Scarlatina in the First (Central) Division of Neath Rural Sanitary District. 4 p., f. cap. 1890.

Mackenzie, *W. Leslie.* Public Health Propaganda in the Counties. 8 p., 8vo. Excerpt *Sanitary Journal*, September, 1891.
The Author.

Madrid. Boletin Mensual de Estadistica Demografico-Sanitoria, 1879-83 and 1884-85. 2 vols. 500 p. and 450 p. 4to. Tables and Maps. *Prof. Vilanova y Piersa.*

——— Cólera Morbo Asiático en España durante el año de 1885. 709 p., 8vo. Plates. Madrid, 1887. *Prof. Vilanova y Piersa.*

Madrid. Congreso Internacional de Higiene y Demografia celebrado en Vienna én, 1887. 415 p., 8vo. Madrid, 1889.
Prof. Vilanova y Piersa.

——— Congresos Mëdicos de Amberes y Perusa. 508 p., 8vo. Madrid, 1887. *Prof. Vilanova y Piersa.*

——— Demografia Sanitaria Madrid, España. 99 p., 8vo. Madrid, 1889. *Prof. Vilanova y Piersa.*

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——— Part I. of Report on Water Supply and Sewerage. 857 p., 8vo. Boston. *The State Board of Health.*

——— *State Board of Health.* Experimental Investigations upon the Purification of Sewage by Filtration and by Chemical Precipitation, and upon the Intermittent Filtration of Water, made at Lawrence (Mass), 1888-90. Part II. of Report on Water Supply and Sewerage. 910 p., 8vo. Boston, 1890. *The Board.*

——— *State Board of Health.* Twenty-Second Annual Report, 1890. 588 p., 8vo. Boston, 1891. *The Board.*

MEDICAL OFFICERS' AND ANALYSTS' REPORTS.

Birmingham ..	for the year 1890.		*Dr. Alfred Hill.*
Bolton	,,	,,	*Dr. F. E. Adams.*
Brighton	,,	,,	*Dr. A. Newsholme.*
Cambridge	,,	,,	*Dr. Bushell Anningson.*
Chesterton Union *Rural Sanitary Authority.*	,,	1887. 1888. 1889.	,, ,,
Coventry	,,	1890.	*Dr. H. Fenton.*
Cromer	,,	,,	*S. T. Taylor.*
Ely Union *Rural Sanitary Authority* ..	,,	1887. 1888. 1889. 1890.	*Dr. Bushell Anningson.*
Erpingham Union ..	,,	,,	*S. T. Taylor.*
Hackney	,,	,,	*Dr. J. W. Tripe.*
Hastings	,,	,,	*Dr. A. S. Wilson.*
Kettering	,,	,,	*J. Rains.*
Lambeth	,,	1889.	*J. Baxter.*
Liverpool	,,	1890.	*Dr. J. Stopford Taylor.*
Newcastle	,,	,,	*Dr. H. E. Armstrong.*
River Tyne Port Sanitary Authority	,,	,,	,, ,,
St. Faith's Union ..	,,	,,	*S. T. Taylor.*
St. George's, Hanover Square	,,	,,	*Prof. W. H. Corfield.*
St. Giles	,,	,,	*Dr. S. R. Lovett.*
St. Ives *Rural Sanitary Authority* ..	,,	,,	*Dr. Bushell Anningson.*
St. Mary Abbotts (*Analyst's*)	,,	,,	*Charles E. Cassal.*
,, ..	,,	,,	*Dr. T. O. Dudfield.*

MEDICAL OFFICERS' AND ANALYSTS' REPORT.—*Continued.*

St. Pancras	for the year 1890.		*J. F. J. Sykes.*
Salford	,,	,,	*Dr. C. E. Paget.*
Stretford	,,	,,	*W. J. Heslop.*
Torquay	,,	,,	*P. Q. Karkeek.*
Wandsworth ..	,,	,,	*The Board.*
Whitechapel ..	,,	,,	*Dr. Joseph Loane.*
Wolverhampton ..	,,	,,	*E. J. Franks.*
,, (*Report of Sanitary Committee*..	,,	,,	,, ,,

Metropolitan Asylums Board. Reports for the year 1890. 180 p., maps and tables, 8vo. London, 1891. *The Board.*

Monckton, *C.* Pure Spring Water for London, proposed by G. Webster. 10 p., 4to. London, 1890. *W. Whitaker.*

New Hampshire *State Board of Health.* Ninth Annual Report for year ending October, 1890. 344 p., 8vo. Manchester, U.S.A. 1890. *Irving A. Watson.*

New Jersey *State Board of Health.* Fourteenth Annual Report and Report of the Bureau of Vital Statistics, 1890. 395 p., 8vo. New Jersey, 1890. *The Board.*

New York *State Board of Health.* Eleventh Annual Report. Vol I. and II. 935 p., 8vo. Albany, 1891. *The Board.*

Nottingham, *Meteorology of,* for 1890. Folio. Tables and Diagrams. *P. Boobyer, M.B.*

Paget, *Charles E.* County and Borough of Salford. Special Report on the Recent Prevalence of Diphtheria. 33 p., 8vo. Maps. Salford, 1891. *The Author.*

PERIODICALS.

Weekly.

British Medical Journal.
Builder.
Contract Journal.
Engineering and Building Record.
Industries.
Journal d'Hygiène.
Local Government Chronicle.
Metropolitan.
Nursing Record.
Sanitary News.

Monthly.

Building World.
Plumber and Decorator.
Practitioner.
Public Health.
Sanitarian.
Sanitary Record.
Sei-i-Kwai Medical Journal.

Pilley, *J. J.* Hygiene, the Principles of Health. 190 p., 8vo. London, 1888. *The Author.*

——— South Kensington Hygiene. 190 p., 8vo. London, 1889. *The Author.*

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Porter, *H. W.* On some considerations suggested by the Annual Reports of the Registrar-General, being an inquiry into the question as to how far the inordinate mortality in this country exhibited by those reports is controllable by Human Agency. 73 p., 8vo. Extract from the "Assurance Magazine and Journal of the Institute of Actuaries," Vol. IX.

Registrar-General, *England.* Annual Summary of Births, Deaths, and Marriages, and Causes of Death in London and other great towns, 1890. 59 p., 8vo. London, 1891. *Registrar-General.*

——— *England.* Fifty-second Annual Report of the Registrar-General of Births, Deaths, and Marriages, in England, 1889. 228 p., 8vo. London, 1890.

——— *Scotland.* Thirty-fourth Detailed Annual Report of the Registrar-General of Births, Deaths, and Marriages, in Scotland (Abstracts of, 1888). 459 p., 8vo. Edinburgh, 1889.

Richmond *Main Sewerage and Drainage.* An account of the works carried out by the Richmond Main Sewerage Board for the collection and disposal of the sewage of the parishes of Richmond, Barnes, Mortlake, Kew, and Petersham, with a brief history of the subject. 16 p., maps. London, 1891. *W. Whitaker.*

Robinson, *Prof. H.* Address on Electric Lighting, at Electrical Exhibition, St. Pancras Vestry Hall, on 20th March, 1891. 7 p., 8vo. London, 1891. *The Author.*

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——— Azione dei microfiti sui composti arsenicali fissi. 7 p. Roma, 1891. *Ministero dell' Interno.*

——— Circa I Fatti Principali Riguardansi d'Igiene e la Sanità Pubblica, nel Regno nell'ultimo trimestre, 1890, e gennaio, 1891. 44 f. cap., 4to. Roma, 1891.

——— Circa I Fatti Principali Riguardansi d'Igiene e la Sanità Pubblica, nel Regno nei mesi di Giugno, Luglio Agosto e Settembre del, 1891. 17 p. Roma, 1891. *Ministero dell' Interno.*

Rome. Dell' analisi degli Alcool Sotto il Riguardo Igienico. 12 p., f. cap. Roma, 1891.

——— Il regolamento sul meretricio davanti al consiglio superiore di sanità. 66 p., f. cap. Roma, 1891. *Ministero dell' Interno.*

——— La Linfa di Koch nella Cura Della Morva del Cavallo. 4 p., f. cap. Roma, 1891.

——— Regolamento Speciale di Polizia Mortuaria. 36 p., 8vo. Roma, 1891. *Direzione della Sanità Publica.*

——— Regolamento Speciale sulle Conservazione dell Vaccino e sulla Vaccinazione obligatoria. 10 p., 8vo. Roma, 1891. *Direzione della Sanità Publica.*

——— Regolamento sul meretricio nell'interesse dell'ordine pubblico, della salute publica el del buon costume Approvato condecreto. Ministeriale, 27 Octobre, 1891. Roma, 1891. *Ministero dell' Interno.*

——— Su di un apparecchio destinato allo studio della permeabilità all'acqua dei materiali da costruzione. 8 p., f. cap. Roma, 1891. *Ministero dell' Interno.*

——— Sulla Filtrazione dei liquami putrescibili attraversola torba. 13 p., f. cap. Roma, 1891. *Ministero dell' Interno.*

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Russell, *Hon. Rollo.* The Spread of Influenza, its supposed relations to Atmospheric conditions. 59 p., 8vo. London, 1891. *The Author.*

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Saunders, *Dr. W. S.* Report on the Analysis of Water from the Artesian Well in Stoney Lane, Houndsditch. 12 p., 8vo. London, 1891. *W. Whitaker.*

Shone, *Isaac.* A Critique upon Mr. Mansergh's Report on the Drainage of Melbourne. London, 1891. 236 p., 8vo. *The Author.*

Sonsino, *Dr. Pospero.* The principal and most efficacious means of preventing the spread of Entozoal affections in man. 8 p., 4mo. Reprint from *Lancet*, August 22nd and 29th, 1891. *The Author.*

Symons, *G. J.* Symons's British Rainfall, 1888-89-90. 203, 178, and 206 pp., and Tables. 8vo. London. *The Author.*

Teale, *T. Pridgen.* Dangers to Health. 172 p., 8vo. Plates. London, 1883. *The Author.*

Thompson, *Gilbert.* On Sanitation in Health Resorts. 5 p., 8vo. Reprinted from Transactions of the Royal Scottish Society of Arts. Glasgow, 1890. *The Author.*

Thompson *Sir H.* Modern Cremation: Its History and Practice. 163 p., 8vo. London, 1891. *The Author.*

Thresh, *Dr. John C.* The Housing of the Working Classes in the Chelmsford and Maldon Rural Sanitary Districts. 24 p., 8vo. Chelmsford, 1891. *The Author.*

Thresh, *Dr. John C.* Report on the Water Supplies of the various Villages and Hamlets in the Chelmsford and Maldon Rural Sanitary Districts. 50 p., 8vo. Chelmsford. *The Author.*

United States' Army. Index-Catalogue of the Library of the Surgeon-General's Office. Vol. XI., 1102 p. Vol. XII., 1004 p. Washington, 1890 & 1891. *The Surgeon-General U.S. Army.*

United States. Report of the Surgeon-General of the Army to the Secretary of War, for the fiscal year ending June 30th, 1891. 144 p., 8vo. Washington, 1891. *The Surgeon-General U.S. Army.*

——— Report of the Surgeon-General of the Army to the Secretary of War for the fiscal year ending June 30th, 1890. 115 p., 8vo. Washington, 1890. *The Surgeon-General U. S. Army.*

Walley, *Thomas.* A practical Guide to Meat Inspection. 188 p., 8vo. Edinburgh, 1890. *Purchased.*

Washington. Report of the United States' Commissioner on Cholera in Europe and India. 946 p., 4to. Plates and Maps. Washington, 1890. *Department of State.*

Whitaker, *W., and A. H. Green.* Preliminary Report on the possibility of obtaining a Supply of Water for London within the Thames Basin. 20 p., 8vo. London, 1891. *The Author.*

MEETINGS FOR 1892.

JANUARY.

4 M. Exhibition Committee, 5 p.m.
6 W. Lecture to Sanitary Officers, Derby, 3 p.m.
13 W. Finance Committee, 4 p.m.
13 W. Council Meeting, 5 p.m.
13 W. Lecture to Sanitary Officers, Derby, 3 p.m.
20 W. Lecture to Sanitary Officers, Derby, 3 p.m.
20 W. Lecture at Carpenters' Hall, 8 p.m.
25 M. Museum Lecture and Library Committee, 5 p.m.
27 W. Lecture at Carpenters' Hall, 8 p.m.
27 W. Lecture to Sanitary Officers, Derby, 3 p.m.
29 F. Lecture to Sanitary Officers, 8 p.m.

FEBRUARY.

1 M. Exhibition Committee, 5 p.m.
2 Tu. Lecture to Sanitary Officers, 8 p.m.
3 W. Lecture at Carpenters' Hall, 8 p.m.
3 W. Lecture to Sanitary Officers, Derby, 3 p.m.
5 F. Lecture to Sanitary Officers, 8 p.m.
9 Tu. „ „ „ „
10 W. Finance Committee, 4 p.m.
10 W. Council Meeting, 5 p.m.
10 W. Sessional Meeting, 8 p.m.
10 W. Lecture to Sanitary Officers, Derby, 3 p.m.
10 W. Lecture at Carpenters' Hall, 8 p.m.
12 F. Lecture to Sanitary Officers, 8 p.m.
16 Tu. „ „ „ „
17 W. Lecture to Sanitary Officers, Derby, 3 p.m.
17 W. Lecture at Carpenters' Hall, 8 p.m.
19 F. Lecture to Sanitary Officers, 8 p.m.
22 M. Museum Lecture and Library Committee, 5 p.m.
23 Tu. Lecture to Sanitary Officers, 8 p.m.
24 W. Lecture to Sanitary Officers, Derby, 3 p.m.
24 W. Lecture at Carpenters' Hall, 8 p.m.
26 F. Lecture to Sanitary Officers, 8 p.m.
26 F. Examination Committee, 5 p.m.

MARCH.

1 Tu. Lecture to Sanitary Officers, 8 p.m.
2 W. Lecture to Sanitary Officers, Derby, 3. p.m.
2 W. Lecture at Carpenters' Hall, 8 p.m.
4 F. Lecture to Sanitary Officers, 8 p.m.

MARCH—(*Continued.*)

4 F. } Examination for Inspectors of
5 S. } Nuisances, Bristol.
5 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
7 M. Exhibition Committee, 5 p.m.
8 Tu. Lecture to Sanitary Officers, 8 p.m.
9 W. Finance Committee, 4 p.m.
9 W. Council Meeting, 5 p.m.
9 W. Sessional Meeting, 8 p.m.
9 W. Lecture to Sanitary Officers, Derby, 3 p.m.
9 W. Lecture at Carpenters' Hall, 8 p.m.
11 F. Lecture to Sanitary Officers, 8 p.m.
12 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
12 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
15 Tu. **Ordinary General Meeting, 4 p.m.**
15 Tu. Lecture to Sanitary Officers, 8 p.m.
16 W. Lecture to Sanitary Officers, Derby, 3 p.m.
16 W. Lecture at Carpenters' Hall, 8 p.m.
17 Th. Builders' Examination Committee, 4.30 p.m.
18 F. Lecture to Sanitary Officers, 8 p.m.
19 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
19 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
22 Tu. Lecture on Domestic Hygiene, 3 p.m.
22 Tu. Lecture to Sanitary Officers, 8 p.m.
23 W. Lecture to Sanitary Officers, Derby, 3 p.m.
25 F. Lecture on Domestic Hygiene, 3 p.m.
25 F. } Examination in Practical Sanita-
26 S. } tion and in Building so far as it relates to Sanitary Construction, at Carpenters' Hall.
26 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
26 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
26 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
28 M. Museum Lecture and Library Committee, 5 p.m.
29 Tu. Lecture on Domestic Hygiene, 3 p.m.
30 W. Lecture to Sanitary Officers, Derby 3 p.m.
31 Th. Examination Committee, 5 p.m.

APRIL.

1 F. Lecture on Domestic Hygiene, 3 p.m.
2 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
2 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
2 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
2 S. Lecture to Sanitary Officers, Norwich, 2 p.m.
4 M. Exhibition Committee, 5 p.m.
8 F. } Examination for Inspectors of
9 S. } Nuisances, London.
9 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
9 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
9 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
9 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
13 W. Finance Committee, 4 p.m.
13 W. Council Meeting, 5 p.m.
15 F. *Good Friday.*
16 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
18 M. *Easter Monday.*
23 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
23 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
23 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
23 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
25 M. Museum Lecture and Library Committee 5 p.m.
28 Th. } Examination for Inspectors of
29 F. } Nuisances, Derby.
30 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
30 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
30 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
30 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.

MAY.

2 M. Exhibition Committee, 5 p.m.
7 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
7 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
7 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
7 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.

MAY—(*Continued.*)

11 W. Finance Committee, 4 p.m.
11 W. Council Meeting, 5 p.m.
14 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
14 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
14 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
14 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
21 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
21 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
21 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
21 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
23 M. Museum Lecture and Library Committee, 5 p.m.
28 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
28 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
28 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
28 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
30 M. Exhibition Committee, 5 p.m.

JUNE.

4 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
4 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
6 M. *Whit Monday.*
8 W. Finance Committee, 4 p.m.
8 W. Council Meeting, 5 p.m.
10 F. Examination Committee, 5 p.m.
10 F. } Examination for Inspectors of
11 S. } Nuisances, Wakefield.
11 S. Lecture to Sanitary Officers, Wakefield, 3 p.m.
11 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
11 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
11 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
17 F. } Examination for Surveyors, Lon-
18 S. } don.
18 S. Lecture to Sanitary Officers, Cardiff, 3 p.m.
18 S. Lecture to Sanitary Officers, Newcastle, 7 p.m.
18 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.

JUNE—(*Continued.*)

24 F. } Examination for Inspectors of
25 S. } Nuisances, Newcastle-on-Tyne.
25 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
27 M. Museum Lecture and Library Committee, 5 p.m.

JULY.

2 S. Lecture to Sanitary Officers, Norwich, 2.30 p.m.
4 M. Exhibition Committee, 5 p.m.
8 F. } Examination for Inspectors of
9 S. } Nuisances, Cardiff.
13 W. Finance Committee, 4 p.m.
13 W. Council Meeting, 5 p.m.
15 F. } Examination for Inspectors of
16 S. } Nuisances, Norwich.
18 M. Congress and Editing Committee, 5 p.m.
25 M. Museum Lecture and Library Committee, 5 p.m.

SEPTEMBER.

12th.—Congress and Exhibition opens at Portsmouth.

OCTOBER.

3 M. Exhibition Committee, 5 p.m.
4 Tu. Lecture to Sanitary Officers, 8 p.m.
7 F. " " " "
11 Tu. " " " "
12 W. Finance Committee, 4 p.m.
12 W. Council Meeting, 5 p.m.
14 F. Lecture to Sanitary Officers, 8 p.m.
17 M. Congress and Editing Committee, 5 p.m.
18 Tu. Lecture to Sanitary Officers, 8 p.m.
21 F. " " " "
24 M. Museum Lecture and Library Committee, 5 p.m.
25 Tu. Lecture to Sanitary Officers, 8 p.m.
28 F. " " " "

NOVEMBER.

1 Tu. Lecture to Sanitary Officers, 8 p.m.
4 F. " " " "
7 M. Exhibition Committee, 5 p.m.
8 Tu. Lecture to Sanitary Officers, 8 p.m.
9 W. Finance Committee, 4 p.m.
9 W. Council Meeting, 5 p.m.
11 F. Lecture to Sanitary Officers, 8 p.m.
15 Tu. " " " "
18 F. Lecture to Sanitary Officers, 8 p.m.
18 F. Lecture at Carpenters' Hall, 8 p.m.
22 Tu. Lecture to Sanitary Officers, 8 p.m.
23 W. Lecture at Carpenters' Hall, 8 p.m.
25 F. Examination Committee, 5 p.m.
25 F. Lecture to Sanitary Officers, 8 p.m.
25 F. Lecture at Carpenters' Hall, 8 p.m.
28 M. Museum Lecture and Library Committee, 5 p.m.
30 W. Lecture at Carpenters' Hall, 8 p.m.

DECEMBER.

2 F. Lecture at Carpenters' Hall, 8 p.m.
2 F. } Examination for Inspectors of
3 S. } Nuisances, London.
5 M. Exhibition Committee, 5 p.m.
7 W. Lecture at Carpenters' Hall, 8 p.m.
9 F. } Examination in Practical Sanitation and in Building so far as it
10 S. } relates to Sanitary Construction, at Carpenters' Hall.
14 W. Finance Committee, 4 p.m.
14 W. Council Meeting, 5 p.m.
14 W. Sessional Meeting, 8 p.m.
16 F. } Examination for Inspectors of
17 S. } Nuisances, Liverpool.
19 M. Museum Lecture and Library Committee, 5 p.m.

NOTE.—*The next Congress and Exhibition will be held at Portsmouth, commencing September 12th.*

LIST OF HON. FELLOWS, FELLOWS, MEMBERS, AND ASSOCIATES.

Additions and Corrections to December 31st, 1891.

HON. FELLOWS, 27; FELLOWS, 154;
MEMBERS, 450; ASSOCIATES, 447.—TOTAL, 1078.

HONORARY FELLOWS.

Date of Election.

AUSTRIA-HUNGARY.

1890. June. VON GRUBER, Prof. Franz Ritter, 1, *Tiefer Graben* 3, *Vienna.*

1890. June. FODOR, Dr., *Professor of Hygiene, Buda-Pesth.*

BELGIUM.

1890. June. PUTZEYS, Dr. Felix, *Professor of Hygiene at the University of Liège.*

EGYPT.

1890. Dec. GREENE, Dr. H. R., Pasha, *Chief of the Sanitary Department, Cairo.*

FRANCE.

1890. June. BROUARDEL, Dr. Paul, *Prof. and Dean of the Faculty of Medicine, Paris.*

1890. June. CORNIL, Dr. V., *Senator*, 19, *Rue St. Guillaume, Paris.*

1890. June. PASTEUR, Prof. Louis, 25, *Rue Dutot, Paris.*

1890. June. DE PIÉTRA SANTA, Dr. Prosper, *Hon Sec. of the French Society of Hygiene*, 30, *Rue du Dragon, Paris.*

1890. June. VALLIN, Dr. Emile, *Professor of Hygiene, Director of the School of the Military Sanitary Service, Lyons.*

1890. June. MARIÈ DAVY, Dr. H., *Hon. President of the French Society of Hygiene.*

GERMANY.

1890. June. HOBRECHT, Dr., *Engineer, Berlin.*

1890. June. VON HOFMANN, Prof. A. W., *Professor of Chemistry, Berlin.*

1890. June. KOCH, Dr., *Director of the Hygienic Institute, Berlin.*

1890. June. PETTENKOFER, Dr., *Professor of Hygiene at the University of Munich.*

1890. June. ROTH, Prof. Dr. W., *Surgeon-General*, 6, *Kaizer Wilhelm Platz, Dresden.*

1890. June. VIRCHOW, Dr. Rudolph, *Professor of Pathology, Berlin.*

HOLLAND.

1890. June. DE MEYER, Dr. van Overbeek, *Professor of Hygiene at the State University of Utrecht, Netherlands.*

ITALY.

1890. June. Betocchi, Com^re. Alessandro, Prof., *Civil Engineer, Ministry of Public Works, Rome.*
1890. June. Corradi, Prof. Alfonse, *Rector of the University of Pavia.*
1890. June. Pacchiotti, Dr. Giacinto, *Professor of Hygiene, Turin.*

ROUMANIA.

1890. June. Felix, Dr. J., *Professor of Hygiene, Bucharest.*

RUSSIA.

1890. June. Suzor, Comte de, *Architect-in-chief, Ligue de Cadets* 21, *St. Petersburgh.*

SWITZERLAND.

1890. June. Guillaume, Dr., *Director of the Federal Bureau of Statistics, Berne.*

TURKEY.

1890. June. Zoëros, A., Pasha, *Professor at the School of Medicine, Director of the Bacteriological Institute, Secretary-General of the Administration of Public Medicine and Hygiene, Constantinople.*

UNITED STATES.

1890. June. Billings, Dr. John S., *Washington, D.C.*
1890. June. Bowditch, Dr. Henry J., *Boston.*
1890. June. Walcott, Dr. Henry P., *Cambridge, Massachusetts.*

FELLOWS (Fellow San. Inst.)

† Marked thus have passed the Examination of the Institute for Local Surveyors.

1889. Dec. Abel, Sir Frederick, K.C.B., F.R.S., *Imperial Institute, Imperial Institute Road, S.W.; and* 40, *Cadogan Place, S.W.*
1891. Dec. Acland, Sir Henry W., K.C.B., M.D., D.C.L., F.R.S., *Broad Street, Oxford.*
1888. Oct. Adams, G. E. D'Arcy, M.D., D.P.H.CAMB., F.G.S., 1, *Clifton Gardens, Maida Vale, W.*
1888. Oct. Aitken, Prof. Sir William, M.D., F.R.S., *Woolston, near Southampton.*
1888. Oct. Albany, H.R.H. The Duchess of, *Claremont, Esher.*
1888 Oct. Angell, Lewis, M.INST.C.E., F.K.C.LOND., *Town Hall, Stratford, E.*
1890. Feb. Annington, Bushell, M.A., M.D., *Cambridge.*
1888. Oct. Archer, John A., 79, *Larkhall Rise, S.W.*
1889. Dec. Armistead, William, M.B., M.O.H., *Shelford, Cambridge.*

1889. Dec. Barry, Charles, F.S.A., 1, *Victoria Street, S.W.*
1888. Dec. Bass, Hamar Alfred, M.P., *Burton-on-Trent.*
1888. Oct. Bell, Major C. W., J.P., D.L., *Yewhurst, East Grinstead, Sussex.*
1888. Oct. Birch, R. W. Peregrine, M.INST.C.E., 5, *Queen Anne's Gate, S.W.*
1889. Dec. Blomfield, Sir A. W., M.A., F.R.I.B.A., 6 *Montagu Place, W.*
1888. Oct. Blyth, A. Wynter, M.R.C.S., L.S.A., *Court House, Marylebone.*
1888. Oct. †Boulnois, H. Percy, M.INST.C.E., *City Engineer, Liverpool.*
1890. Jan. Bowman, Sir William, Bart., M.D., LL.D., F.R.S., 5, *Clifford Street, Bond Street, W.*
1890. Jan. Brett, A. T., M.D., M.O.H., *Watford House, Watford.*
1888. Oct. Brighten, W. G., 108, *Fenchurch Street, E.C.*
1889. Dec. Brock, J. H. E., M.D., B.SC.LOND., 115, *Adelaide Road, South Hampstead.*
1888. Oct. Brown, Harry, *University College, Gower Street, W.C.*
1888. Oct. Browning, Benjamin, L.R.C.P., M.R.C.S., D P.H.CAMB., M.O.H., 16, *Royal Terrace, Weymouth.*
1888. Oct. Burbery, J. Stone, *Trent House, West Cowes, I. of W.*
1888. Oct. Burdett, Henry C., F.S.S., F.L.S., *The Lodge, Porchester Square, W.*
1888. Oct. Burgess, Peter, M.A., M.B., *Driffield, Yorkshire.*
1888. Oct. Cambridge, H.R.H. the Duke of, K.G., *Gloucester House, Park Lane, W.*
1888. Oct. Carew, R. R., *Carpenders, Watford, Herts.*
1888. Oct. Carpenter, Alfred, M.D. LOND., M.R.C.S., D.P.H.CAMB., *Heath Lodge, Morland Park, Croydon.*
1888. Oct. Carter, R. Brudenell, F.R.C.S., 27, *Queen Anne Street, Cavendish Square, W.*
1888. Aug. Cassal, Charles E., F.I.C., F.C.S., *Town Hall, Kensington. W.*, (*Vestry Hall, Mount Street, Grosvenor Square, W.*), (*Brenne House, Wandsworth Common, S.W.*).
1890. May. Cates, Arthur, F.R.I.B.A., 7, *Whitehall Yard, S.W.*
1888. Oct. Clark, F. Le Gros, F.R.S., *The Thorns, Sevenoaks, Kent.*
1888. Oct. Collins, H. H., F.R.I.B.A., 61, *Old Broad Street, E.C.; and* 5, *Randolph Road, W.*
1889. Dec. Collins, Wm. J., M.D., B.SC.LOND., D.P.H., 1, *Albert Terrace, Regent's Park, N.W.*
1888. Oct. Colman, J. J., M.P., *Carrow House, Norwich.*
1888. Aug. Corfield, Prof. W. H., M.A., M.D.OXON., F.R.C.P.LOND., 19, *Savile Row, W.*
1888. Oct. Crawford, Sir Thomas, M.D., K.C.B., 5, *St. John's Park, Blackheath.*
1888. Oct. Cutler, Thomas William, F.R.I.B.A., 5, *Queen Square, Bloomsbury.*
1888. Oct. Davey, Alexander George, M.D., L.R.C.P., M.R.C.S., 9, *Belvedere Street, Ryde, Isle of Wight.*

1891. Mar. DE COURCY MEADE, Thomas, M.INST.C.E., 1, *Park Villas, The Park, Highgate, N.*
1888. Oct. DERBY, RT. HON. EARL OF, D.C.L., LL.D., F.R.S., 33, *St. James' Square, S.W.*
1888. Oct. DOULTON, SIR Henry, *Lambeth, S.W.*
1890. Feb. DOWSON, A., 3, *Gt. Queen Street, Westminster.*
1888. Oct. DOYLE, Patrick, C.E., F.G.S., *Indian Engineering, Spence's Hotel, Calcutta.*
1888. Aug. DUDFIELD, T. Orme, M.D., L.R.C.P., M.R.C.S., 14, *Ashburn Place, Cromwell Road, S.W.*
1888. Oct. DYKE, T. J., F.R.C.S., *The Hollies, Merthyr Tydfil.*
1888. Oct. EATON, John, M.D., *Montreal House, Cleator Moor, Cumberland.*
1888. Oct. ELLIS, W. Horton, F.R.MET.SOC., *Hartwell House, Exeter.*
1888. Oct. EVANS, SIR T. W., F.R.G.S., *Allestree Hall, Derby.*
1890. Dec. EWART, Joseph, M.D., F.R.C.P., J.P., *Montpelier House, Montpelier Terrace, Brighton.*
1888. Oct. FAYRER, SIR Joseph, K.C.S.I., M.D., F.R.C.P., F.R.C.S., LL.D., F.R.S., 53, *Wimpole Street, W.*
1888. Oct. FIELD, Basil, B.A., 36, *Lincoln's Inn Fields, W.C.*
1888. Aug. FIELD, Rogers, B.A., M.INST.C.E., 7, *Victoria Street, Westminster, S.W.*
1888. Oct. FLOWER, MAJOR Lamorock, 48, *Holland Road, W.*
1888. Nov. FORTESCUE, RT. HON. EARL, 48, *Grosvenor Gardens, S.W.*, (*Castle Hill, South Molton, Devon*).
1888. Aug. GALTON, SIR Douglas, K.C.B., D.C.L., LL.D., F.R.S., 12, *Chester Street, Grosvenor Place, S.W.*
1888. Oct. GOWERS, William Richard, M.B., 50, *Queen Anne St., W.*
1888. Oct. GRIMSHAW, Thomas Wrigley, M.D., *Priorsland, Carrickmines, Dublin.*
1888. Oct. HARKER, J., M.D., J.P., *Hazel Grove, Carnforth, Lanc.*
1890. May. HARRIS, Alfred E., L.R.C.P., L.R.C.S., M.O.H., *Health Offices, Sunderland*, (*Brookside Villa, Sunderland*).
1888. Oct. HARRIS, Thomas, F.R.I.B.A., 6, *Southampton Street, Bloomsbury Square, W.C.*
1890. Jan. HARRISON, C., M.D., D.P.H.CAMB., *Newland, Lincoln.*
1888. Oct. HART, Ernest, 38, *Wimpole Street, W.*
1891. Mar. HASTINGS, George Woodyatt, M.P., *Barnard's Green House, near Malvern.*
1888. Oct. HAVILAND, A., M.R.C.S., *Douglas, Isle of Man.*
1890. June. HEHIR, Patrick, M.D., F.R.C.S., D.P.H., *Hyderabad, Deccan, India.*
1890. Jan. HILL, Alfred, M.D., M.R.C.S., L.S.A., *The Council House, Birmingham.*
1888. Oct. HILL, M. Berkeley, M.B., F.R.C.S., 66, *Wimpole Street, W.*
1888. Dec. HIME, Thomas Whiteside, A.B., M.B., L.R.C.S., 54, *Horton Road, Bradford.*
1888. Oct. HODSON, George, M.INST.C.E., F.G.S., *Abbey Buildings, Princes Street, Westminster*, (*Loughborough*).

1889. Dec. HOPE, E. W., *Municipal Offices, Liverpool.*
1888. Oct. HUMPHRY, SIR G. M., M.D., F.R.S., *Cambridge.*
1889. Dec. HUNTER, SIR William Guyer, K.C.M.G., M.P., M.D., F.R.C.P., 21, *Norfolk Crescent, Hyde Park, W.*
1890. Jan. ILIFFE, William, M.R.C.S., 41, *Osmaston Street, Derby.*
1888. Oct. JONES, LIEUT.-COL. A. S., V.C., ASSOC.M.INST.C.E., *Culverside, Carshalton, Surrey.*
1888. Aug. JUDGE, Mark H., A.R.I.B.A., 15, *Connaught Square, W.*
1888. Oct. KELLY, Charles, M.D., F.R.C.P., *Ellesmere, Gratwicke Road, Worthing.*
1888. Dec. KINGDON, J. A., *Grocer's Hall, E.C.*
1888. Oct. LATHAM, Baldwin, M.INST.C.E., F.R.MET.SOC., F.G.S., F.S.S., 13, *Victoria Street, S.W.*, (*Nantwich House, Park Hill Rise, Croydon*).
1888. Oct. LAW, Henry, M.INST.C.E., F.R.MET.SOC., 17, *Victoria Street, S.W.*, (245, *Vauxhall Bridge Road*).
1889. Dec. LAWRENCE, SIR Trevor, BART., M.P., 57, *Prince's Gate, S.W.*
1888. Oct. LAWSON, INSPECTOR-GENERAL R., LL.D., F.S.S., 20, *Lansdowne Road, Notting Hill.*
1888. Oct. LEAF, Charles J., F.L.S., F.S.A., 6, *Sussex Place, Regent's Park, N.W.*
1888. Dec. LEAF, W., LITT.DOC., 6, *Sussex Place, Regent's Park, N.W.*
1888. Aug. LEWIS, PROF. T. Hayter, F.S.A., F.R.I.B.A., 12, *Kensington Garden Square, S.W.*
1888. Oct. LIVESEY, J., M.INST.C.E., 2, *Victoria Mansions, Victoria Street, Westminster, S.W.*
1888. Dec. LONGSTAFF, G. B., M.D., M.A., D.P.H., *Southfield Grange, Wandsworth, S.W.*
1888. Dec. LUBBOCK, RT. HON. SIR John, BART., M.P., D.C.L., F.R.S., *Lombard Street, E.C.*
1888. Oct. MACKEY, John Alexander Dixie, B.A.OXON., 1, *Westbourne Terrace, W.*
1888. Oct. MANSERGH, James, M.INST.C.E., 5, *Victoria Street, S.W.*
1889. Dec. MARTEN, H. J., M.INST.C.E., *The Birches, Codsall, Wolverhampton.*
1888. Oct. MEATH, RT. HON. EARL OF, 83, *Lancaster Gate, Hyde Park.*
1888. Dec. MICHAEL, W. H., Q.C., 45, *Bedford Square, W.C.*, (*Foxgrove Road, Beckenham, Kent*), (*King's Bench Walk, Temple*).
1890. Jan. MURPHY, Shirley F., M.R.C.S., 41, *Queen Anne Street, W.*
1890. June. NEWSHOLME, Arthur, M.D., M.R.C.S., L.S.A., D.P.H., M.O.H., *Town Hall, Brighton*, (15, *College Road, Brighton.*)
1888. Dec. NIGHTINGALE, Miss F., 10, *South Street, Grosvenor Square, W.*
1890. May. NORTH, Samuel W., M.R.C.S., F.G.S., M.O.H., *Micklegate, York.*

1888. Aug. NORTHUMBERLAND, HIS GRACE THE DUKE OF, K.G., D.C.L., LL.D., 2, *Grosvenor Place, S.W.*

1890. Nov. NOTTER, PROFESSOR J. Lane, M.A., M.D., D.P.H., *West Cliffe, Woolston, Southampton.*

1888. Oct. OHREN, Magnus, ASSOC. M. INST. C. E., F.C.S., *Lower Sydenham.*

1888. Oct. OLLARD, J. F., *The Manor House, North Runcton, King's Lynn.*

1888. Oct. OLLARD, William Ludlam, *Musticott House, Walsoken, Wisbeach, Norfolk.*

1889. Nov. PAGET, Charles Edward, M.R.C.S., D.P.H., M.O.H., *Town Hall, Salford.*

1888. Oct. PAGET, J., J.P., *Stuffynwood, Mansfield.*

1888. Aug. PARKES, Charles Henry, *Netherfield, Weybridge.*

1888. Oct. PARKES, Louis Coltman, M.D., M.R.C.S., D.P.H., 61, *Cadogan Square, S.W.*

1888. Oct. PEGGS, J. Wallace, ASSOC.M.INST.C.E., 9, *Welbeck Mansions, Cadogan Terrace, S.W.*, (21, *Queen Anne's Gate, S.W.*).

1888. Oct. PLUMBE, Rowland, F.R.I.B.A., 13, *Fitzroy Square, W.*

1888. Aug. POORE, George Vivian, M.D., F.R.C.P., 30, *Wimpole Street, W.*

1890. Jan. POWELL, Francis Sharp, M.P., 1, *Cambridge Square, W.*, (*Horton Old Hall, Bradford*).

1888. Oct. PRITCHARD, E., M.INST.C.E., F.G.S., 2, *Storey's Gate, S.W.*, (37, *Waterloo Street, Birmingham*).

1888. Oct. RAWLINSON, SIR Robert, K.C.B., M.INST.C.E., 11, *The Boltons, Brompton, S.W.*

1890. Feb. REDWOOD, T. Hall, M.D., *The Lawn, Rhymney.*

1891. Oct. REID, George, M.D., D.P.H., *County Medical Officer of Health, Stafford.*

1888. Oct. REYNOLDS, PROF. J. Russell, M.D., F.R.C.P., F.R.S., 38, *Grosvenor Street, W.*

1888. Nov. RICHARDSON, Benjamin Ward, M.D., LL.D., F.R.S., 25, *Manchester Square, W.*

1888. Oct. RICHARDSON, J., M.INST.C.E., *Methley Park, Leeds.*

1890. Jan. RIPON, MOST HON. MARQUESS OF, K.G., D.C.L., F.R.S., 9, *Chelsea Embankment, S.W.*

1888. Oct. ROBINS, Edward Cookworthy, F.S.A., F.R.I.B.A., 46, *Berners Street, W.*

1888. Oct. ROBINSON, PROF. Henry, M.INST.C.E., 13, *Victoria Street, S.W.*, (54, *Boundary Road, N.W.*).

1888. Oct. RUSSELL, HON. F. A. Rollo., F.R.MET.SOC., *Pembroke Lodge, Richmond Park.*

1888. Oct. RUSSELL, Jas. A., M.A., F.R.C.P. EDIN., M.B., B.SC., F.R.S.E., *Woodville, Canaan Lane, Edinburgh.*

1890. Jan. RUSSELL, J. B., M.D., LL.D., M.O.H., *Glasgow.*

1889. Jan. SALT, Thomas, M.P., 85, *St. George's Square, S.W.*

1889. Dec. SEATON, Edward Cox, M.D., F.R.C.S., *The Limes*, 56, *North Side, Clapham Common.*

1888. Oct. Shaw, George, 20, *King Edward Street, Newgate St., E.C.*
1888. Dec. Sieveking, Sir E. H., M.D., 17, *Manchester Square, W.*
1889. Nov. Smith, James, Osborne, A.R.I.B.A., 34, *Southampton Street, Strand, W.C.*, (65, *Frithfield Gardens, Uxbridge Road, W.*).
1888. Oct. Smith, Prof. William Robert, M.D., F.R.S.E., D.SC., *Barrister-at-Law*, 74, *Great Russell Street, W.C.*, (*Plumstead, Kent*).
1888. Oct. Snell, H. Saxon, F.R.I.B.A., 22, *Southampton Buildings, W.C., and Lynden Lodge, Elmfield Road, Bromley, Kent.*
1888. Oct. Steele, John Charles, M.D., *Guy's Hospital, S.E.*
1889. Mar. Stephens, Henry C., M.P., *Avenue House, Finchley.*
1888. Oct. Strong, Henry John, M.D., *Whitgift House, George Street, Croydon.*
1888. Oct. Sykes, J. F. J., M.B., B.SC., D.P.H., 171, *Camden Road, N.W.*
1888. Aug. Symons, G. J., F.R.S., 62, *Camden Square, N.W.*
1889. Dec. Taylor, J. Stopford, M.D., M.O.H., 6, *Grove Park, Liverpool.*
1889. Dec. Taylor, John W., M.D., D.SC., J.P., M.O.H., *Examiner in Medical Jurisprudence, and for the final B.Sc. in the department of Public Health, University of Edinburgh, Rothesay House, Scarborough.*
1888. Oct. Temple, Right Rev. Frederick, D.D., lord bishop of London, *The Palace, Fulham.*
1888. Oct. Thompson, John, M.D., F.R.C.S., J.P., *Lynton House, Bideford.*
1889. Dec. Thompson, Sir Henry, M.B., 35, *Wimpole Street, W.*
1888. Oct. Thorne, R. Thorne, M.B., 45, *Inverness Terrace, W.*
1888. Oct. Turbervill, Col. T. Picton, *Ewenny Priory, Bridgend, Glamorgan.*
1888. Oct. Turner, Ernest, F.R.I.B.A., 246, *Regent Street, W.*
1888. Aug. Twining, Thomas, *Perryn House, Twickenham.*
1889. Feb. Tyndall, Professor John, LL.D., D.C.L., F.R.S., *Hind Head House, Shotter Mill, near Petersfield.*
1891. Nov. Vacher, Francis, F.R.C.S., *Birkenhead.*
1889. Dec. Walford, Edward, M.D., D.P.H.CAMB., M.R.C.S., M.O.H., *Town Hall, Cardiff.*
1888. Oct. Waring, Col. G. E., Jun., M.INST.C.E., *Newport, Rhode Island, U. S. America.*
1888. Oct. Waterhouse, Alfred, R.A., 20, *New Cavendish St., W.*
1888. Aug. Westminster, His Grace the Duke of, K.G., *Grosvenor House, W.*
1888. Oct. Whitelegge, Benjamin Arthur, M.D., B.SC., D.P.H.CAMB. *Wakefield.*
1888. Oct. Williams, Dawson, M.D., 25, *Old Burlington Street, W.*
1888. Oct. Wilson, George, M.A., M.D., F.R.S.E., 7, *Avon Place, Warwick.*
1889. Jan. Wix, H. A., 3, *King's Bench Walk, Temple, E.C.*

ORDINARY MEMBERS (Mem. San. Inst.)

† Marked thus have passed the Examination of the Institute for Local Surveyors.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

1890. May. Adams, Frederick Edward, M.D., D.P.H., *Town Hall, Bolton.*

1889. Mar. Adams, James, M.D., M.O.H., *Springwell, Barnes, Surrey.*

1891. Dec. Adams, Professor Henry, M.INST.C.E., F.S.I., 60, *Queen Victoria Street, E.C.*

1889. Mar. Adkins, George, L.R.C.P.LOND., D.P.H., M.O.H., *Yealmpton, Plympton, Devon.*

1888. Dec. Airy, Hubert, M.A., M.D., *Local Government Board, S.W.*

1889. Feb. Aldwinckle, Thomas William, F.R.I.B.A.

1888. Oct. Alexander, W. C., *Aubrey House, Campden Hill, W.*

1889. Apr. Allfrey, Charles Henry, M.D., F.R.C.S., D.P.H., *Plas Newydd, Princes Road, St. Leonards-on-Sea.*

1888. Oct. Ames, H. St. Vincent, M.A., *Cote House, Westbury-on-Trym, Bristol.*

1888. Oct. Anderson, Geo., C.E., 35*a*, *Great George Street, Westminster, S.W.*

1889. Jan. †Anderson, John Reid, *The Cottage, Gibson's Hill, Norwood, S.E.*

1890. Dec. Anderson, John, ASSOC.M.INST.C.E., *Town Hall, Montrose, N.B.*

1888. Oct. Andresen, August F., *Priory Cottage, Mill Lane, West Hampstead.*

1888. Oct. Andrew, Capt. C. W., 286, *Kennington Park Road, S.E.*

1889. Mar. Andrews, G. R., *Surveyor, Johannesburg, South Africa.*

1888. Oct. Andrews, Jonathan, 10A, *Mount Street, Berkeley Square, W.*

1890. Apr. Angell, A. Torrington, 2, *Drayton Gardens, S.W.*

1888. Oct. †Angell, John A., ASSOC.M.INST.C.E., *Borough Engineers' Office, West Ham, E.*

1889. Nov. Anson, Frederick Henry, M.A., ASSOC.M.INST.C.E., 15, *Dean's Yard, Westminster, S.W.*

1891. Oct. Armstrong, Henry E., M.R.C.S., L.S.A., M.O.H., *The Health Department, Town Hall, Newcastle-on-Tyne.*

1888. Oct. Armstrong, Prof. H. E., PH.D., F.R.S., 55, *Granville Park, Lewisham, S.E.*

1890. Oct. Aspinall, Miles, *Borough Engineer and Surveyor's Office, Worthing.*

1891. Nov. Atkins, Alfred, A.M.INST.C.E., F.R.I.B.A., *Wanganui, New Zealand.*

1888. Oct. Aumonier, F., 110, *High Street, Manchester Square, W.*

1888. Oct. Baker, Sir Benjamin, K.C.M.G., LL.D., M.INST.C.E., 2, *Queen's Square Place, Westminster.*

1888. Oct. Baker, R., *Ballingdon House, Green Lanes, N.*
1890. May. Barton, John Isaac, *Ryde, (Ventnor), Isle of Wight.*
1891. July. Barwise, Sidney, M.B., D.P.H., M.O.H., *Derbyshire County Council, 61, Uttoxeter New Road, Derby.*
1890. May. Bateman, James, *Assistant Engineer, Natal Government Railway.*
1888. Oct. Bathurst, the Rt. Hon. the Earl, 20, *Grosvenor Gardens, S.W.*
1888. Oct. Baugh, Alfred C., *Egerton Street, Wrexham.*
1888. Oct. Bean, Alexander Thomas, 7, *Victoria Street, S.W.*
1888. Dec. †Beard, E. T., *The Colonial College, Hollesley Bay, Suffolk.*
1888. Oct. Beard, George, *Thickthorn, Kenilworth.*
1888. Oct. Beard, Neville, *The Mount, Ashbourne.*
1889. Dec. Beardmore, George Russell, L.R.C.P.Lond., M.R.C.S., L.S.A., D.P.H.Camb., *Warwick House, Upper Street, Islington.*
1888. Oct. Beck, Marcus, M.B., 30, *Wimpole Street, W.*
1888. Oct. Beddoe, John, B.A., M.D., F.R.S., *The Chantry, Bradford-on-Avon.*
1888. Oct. Beevor, Mrs. Elizabeth, 129, *Harley Street, W.*
1888. Oct. Bell, Thomas, L.R.C.P. Lond., *Uppingham, Rutland.*
1888. Dec. ‡Benjamin, Horace Bernton, F.R.G.S., 28, *Albemarle Street, W.*, (37, *Upper Grosvenor Street, W.*).
1888. Oct. Bennett, Hugh, M.R.C.S., *Builth Wells, Brecon.*
1891. Mar. Bennett, Thomas, Assoc.M.Inst.C.E., F.G.S., *Turner's Hill, Cheshunt.*
1888. Oct. Bernard, William Larkins, 3, *St. Stephen's Chambers, Baldwin Street, Bristol.*
1888. Oct. †Berrington, R. E. W., Assoc.M.Inst.C.E., *Graiseley, Wolverhampton.*
1888. Oct. Bickersteth, E. R., F.R.C.S., 2, *Rodney St., Liverpool.*
1891. Mar. Billingham, J. A. L., *Surveyor, R. Engineers, 4, East Mount Road, York.*
1888. Oct. Black, Surg.-Major W. G., 2, *George Square, Edinburgh.*
1889. Mar. Blair, William Nisbet, Assoc.M.Inst.C.E., *Town Hall, Bootle-cum-Linacre.*
1888. Oct. Blashill, T., F.R.I.B.A., *Superintending Architect, London County Council, Spring Gardens, S.W.*
1889. Mar. Blumer, Frederick Milnes, B.A., M.B., M.O.H., *Foregate Street, Stafford.*
1889. Feb. Bolding, John F., 19, *South Moulton Street, W.*
1888. Oct. Bond, Frederick Adolphus, M.B., C.M.Edin., D.P.H.Edin., *Hetton Lodge, Ferndale, Tunbridge Wells.*
1890. Apr. Boobbyer, Philip, M.B., M.R.C.S., M.O.H., *The Guildhall, Nottingham.*
1888. Dec. Bostock, H., *The Oaklands, Rowley Avenue, Stafford.*
1888. Oct. Box, M. H.
1888. Oct. Brace, W. H., M.D., 7, *Queen's Gate Terrace, S.W.*

1888. Oct. BRACKETT, Wm., 42, *London Road, and* 27, *High Street, Tunbridge Wells.*

1888. Oct. BRADSHAW, James D., B.A., M.B., M.R.C.P., M.R.C.S., 30, *George Street, Hanover Square, W.*

1891. July. BRAGA, Joäo Francisco, L.S.A., F.C.S., F.L.S., F.G S., D.P.H., *Glen Villa, Sunbury-on-Thames.*

1889. Mar. BREBNER, George Reith, M.D., D.P.H., *Bensham Lodge, West Croydon.*

1888. Oct. BRIDGES, J. H., M.B., F.R.C.P., *The Brambles, Wimbledon.*

1891. Jan. BRIGHT, Philip, ASSOC. M. INST. C. E., 2, *Newgate Street, E.C.*

1888. Nov. BRISTOWE, John Syer, M.D., F.R.S., 13, *Old Burlington Street, W.*

1889. Apr. BRODIE, John Shanks, ASSOC.M.INST.C.E., *Town Hall, Whitehaven, Cumberland.*

1889. Mar. BROOKE, Walter, ASSOC. M. INST. C. E., *Town Surveyor, Richmond, Surrey.*

1889. Apr. BROOKE, William, M.D., M.O.H., *Shaw, near Oldham.*

1888. Oct. BROWN, William Ibbs, *St. Michael's Avenue and Guildhall, Northampton.*

1891. Dec. BRUCE, William, M.D., LL.D., M.O.H., *Dingwall, Ross.*

1888. Oct. BRYANT, Thomas, F.R.C.S., 65, *Grosvenor Street, W.*

1891. Oct. BUCKINGHAM, Edward de Vere, *Architect, St. John Street, Winchester.*

1888. Dec. BUCKTON, Mrs. 27, *Ladbroke Square, W.*

1891. May. BULLIS, William Daniel, *Surveyor*, 21, *Finsbury Pavement, E.C.*

1891. July. BULSTRODE, Herbert Timbrell, M.A., M.D., D.P.H., *Metropolitan Asylums Board, South-Western Hospital, Stockwell.*

1888. Dec. †BUNTEN, Charles, *care of W. F. Watkins*, 8, *Park Road, East Hill, Wandsworth.*

1890. Apr. BURDWOOD, James Watson, L.F.P.S., M.O.H., *West Cottage, Bourne, Lincoln.*

1888. Dec. BURMESTER, Miss E., 9, *Park Square, W.*

1890. Jan. BURR, Alfred, F.R.I.B.A., 85, *Gower Street, W.C.*

1889. Apr. BURTON, Samuel Hubert, F.R.C.S., M.O.H., 50, *St. Giles's Street, Norwich.*

1889. Jan. †BURTON, W. Kinninmond, ASSOC.M.INST.C.E. *Professor of Sanitary Engineering, Imperial University, Tokio, Japan.*

1889. Feb. †CAMPBELL, Adam Horsburgh, ASSOC.M.INST.C.E., *Borough Surveyor's Office, Stratford-on-Avon.*

1888. Oct. CAMPBELL, Charles, *Queen Insurance Buildings, Church Street, Sheffield.*

1888. Oct. CAMPBELL, HON. Dudley, 1, *Mitre Court Buildings, Temple.*

1889. Mar. CAMPBELL, Kenneth Findlater, ASSOC. M. INST. C. E., *Borough Engineer, Stockton-on-Tees.*

1888. Oct. CARLINE, John, ASSOC.M.INST.C.E., *Board of Works, Lewisham, S.E.*
1889. Mar. CARLTON, George Brody, ASSOC.M.INST.C.E., *Knighton, Oak Hill Road, Beckenham.*
1888. Nov. CARRITT, Ernest, 18 & 19, *Great St. Helens, E.C.*
1890. Nov. CHART, Robert Masters, *Mitcham, Surrey.*
1888. Oct. CHATTERTON, George, M.INST.C.E., 46, *Queen Anne's Gate, S.W.*
1888. Oct. CHATTOCK, Miss Frances C., *Solihull, Birmingham.*
1888. Oct. CLARKE, James Wright, 8, *Salcott Road, Wandsworth.*
1888. Oct. CLARKSON, J. W., M.R.C.S.E., L.R.C.P.L., *c/o Messrs. H. S. King & Co., Pall Mall, S.W.*
1890. Oct. †CLOTHIER, Samuel Thompson, *Street, Somerset.*
1888. Oct. COATES, C., F.R.C.P., 10, *Circus, Bath.*
1888. Oct. COCK, Frederick, M.D., 1, *Porchester Houses, Porchester Square.*
1888. Oct. COLLINGRIDGE, W., M.A., M.D., D.P.H., *Port of London Sanitary Offices, Greenwich, S.E.*
1888. Oct. COLLINSON, John, 90, *Cromwell Road, S.W.*
1888. Oct. †COMBER, P. F., M.INST.C.E. IRELAND, *Fairy Hill, Bray, Co. Wicklow.*
1888. Oct. †COOPER, C. H., ASSOC.M.INST.C.E., *Local Board Offices, Wimbledon.*
1888. Oct. COOPER, Francis A., ASSOC.M.INST.C.E., *c/o H. F. Cooper, Nottingham and Notts Bank, Newark.*
1888. Nov. COOPER, John, jun., *Croydon.*
1889. Jan. †COOPER, William, 32, *Cheetham Street, Cheetham, Manchester.*
1888. Oct. CORBETT, Joseph, 9, *Albert Square, Manchester.*
1891. Nov. CORKE, Cecil A., L.R.C.P., M.O.H., 72, *High Street, Wem, Shropshire.*
1891. Dec. CORNER, John, 543, *Cuyo, Buenos Ayres.*
1888. Oct. CORSAN, John R., 80, *Gray's Inn Road, W.C.*
1888. Oct. COURTNEY, MAJOR D. C., R.E., 22, *Collingham Gardens, Kensington, S.W.*
1889. Oct. COWAN, Peter Chalmers, B.SC. (EDIN.), ASSOC.M.INST.C.E., *County Surveyor, Downpatrick.*
1888. Oct. COWTAN, Frank, 309, *Oxford Street, W.*
1890. Oct. †‡CRAIG, G. A., *Wood's Temperance Hotel, High Street, Berwick-on-Tweed.*
1888. Oct. CRANBROOK, THE RT. HON. VISCOUNT, G.C.S.I., 17, *Grosvenor Crescent, S.W.*
1891. Mar. CRAWFORD-ROE, William Alexander F.R.C.S.E., *Surgeon-Major Indian Medical Service, Bengal.*
1889. June. CREGEEN, Hugh Stowell, 42, *Freelands Road, Bromley, Kent.*
1888. Oct. †CRIMP, W. Santo, M.INST.C.E., F.G.S., *London County Council, Spring Gardens.*
1891. June. CRISP, James Gregory, 10, *Sherborne Terrace, Cheltenham.*

1888. Oct. CROMBIE, James, M.B., D.P.H.EDIN., *Sidcup.*
1888. Oct. CROWLEY, Frederick, *Ashdell, Alton, Hants.*
1889. Mar. CUFF, Robert, M.B., M.R.C.S., M.O.H., 28, *Huntriss Row, Scarborough.*
1888. Oct. †CURWEN, John F., 51, *Highgate, Kendal.*
1890. Mar. DABBS, George Henry Roque, M.D., M.R.C.S., M.O.H., *Highfields, Shanklin, I. of Wight.*
1888. Oct. †DARCH, John, 74, *Sarsfield Road, Balham, S.W.*
1890. Oct. †DAVIS, Neville Brookes, ASSOC.M.INST.C.E., P.A.SURV. INST., *Water Works Office, Leicester.*
1888. Oct. DAWSON, Charles James, *Surveyor to the Local Board Barking.*
1888. Oct. DAY, Ernest, F.R.I.B.A., 5, *Foregate Street, Worcester.*
1888. Oct. DEBENHAM, F. G., *Cheshunt Park, Herts.*
1888. Oct. DE CHAUMONT, Miss Anna Kennedy Francois, *Alladale, Woolston, Southampton.*
1888. Oct. DE SOLDENHOFF, Richard, 12, *Newport Road, Cardiff.*
1888. Oct. DENNIS, Nelson F., *Town Surveyor, West Cowes.*
1891. Dec. DENTON, Eardley Bailey, B.A., M.INST.C.E., *Civil Engineer*, 9, *Bridge Street, Westminster.*
1889. May. DIXEY, Harry Edward, M.D., *Woodgate, Great Malvern.*
1891. May. DODD, Peter, ASSOC.M.INST.C.E., 3, *Clifton Terrace, Southend-on-Sea.*
1889. Apr. DONOVAN, Dennis D., L.R.C.P., L.R.C.S., *Superintendent Medical Officer of Health, City of Cork.*
1888. Oct. DOUGLAS, George, *Burslem.*
1888. Oct. DOULTON, James Duncan, *Lambeth.*
1891. Jan. DRAYSON, Walter B. H., 2, *Newgate Street, E.C.*
1890. Jan. DRUMMOND, Edward, M.D., M.R.C.S., D.P.H.CAMB., *The Ivy House, Hampstead; and* 3, *Piazza di Spagna, Rome.*
1889. Nov. DUNLOP, Archibald, M.D., M.R.C.S., M.O.H., *Holywood, Belfast.*
1889. Apr. EATON-SHORE, George, ASSOC.M.INST.C.E., *Borough Engineer*, 190, *Edlestone Road, Crewe.*
1888. Oct. EBURY, RT. HON. LORD, *Moor Park, Rickmansworth.*
1888. Oct. ECCLES, Miss Jane Helen, 3, *Dean's Yard, Westminster, S.W.*
1891. Feb. EDGE, Frederic James, ASSOC.M.INST.C.E., *Public Offices, Cleator Moor, Cumberland.*
1888. Oct. ELFORD, John, *Borough Surveyor, Poole, Dorset.*
1888. Dec. EMERSON, W., F.R.I.B.A., 8, *The Sanctuary, S.W.*
1889. May. ENGLISH, Edgar, M.R.C.S., L.S.A., D.P.H., *High Street, Mexborough, Rotherham.*
1889. Jan. ERICHSEN, J. Eric, F.R.S., 6, *Cavendish Place, W.*
1888. Nov. EVERS, SURG.-MAJOR B., *care of Messrs. Watson Bros.*, 27, *Leadenhall Street, E.C.*
1889. Jan. FARRER, SIR T. H., BART., 27, *Bryanston Square, W.*
1888. Oct. FAWCETT, William Milner, M.A., F.R.I.B.A., 1, *Silver Street, Cambridge.*

1891. July. †Felkin, Howard Riley, 23, *Brackley Road, Chiswick.*
1888. Oct. Fernie, C. W. B., *Keythorpe, Leicester.*
1888. Oct. Field, Horace, 14, *Gray's Inn Square, W.C.*
1888. Oct. Fisher, T. J., 50, *Thorne Road, South Lambeth.*
1891. Oct. †‡Flower, Thomas James Moss, *Liverpool Chambers, Corn Street, Bristol.*
1888. Oct. Forde, H. C., M.INST.C.E., 4, *Great Winchester St., E.C.*
1891. May. Fosbroke, G. H., M.R.C.S., D.P.H., M.O.H., *The County Hall, Worcester.*
1888. Oct. Foster, Reginald Le Neve, F.C.S., *North Road, Droylsdon, Manchester.*
1888. Oct. Frank, Philip, M.D., *Cannes, France.*
1888. Oct. Fraser, James, M.INST.C.E., 100, *Castle Street, Inverness.*
1889. Jan. Fraser, W. J., ASSOC.M.INST.C.E., 98, *Commercial Road, E.*
1888. Nov. Fryer, James, 13, *Bloomsbury Street, Vincent Square, S.W.*
1888. Oct. Galton, Francis, F.R.S., 42, *Rutland Gate, S.W.*
1889. Mar. Gange, Frederick A., M.D., M.O.H., *Faversham, Kent.*
1888. Oct. †Geen, Harry, *Hillside, Okehampton, Devon.*
1891. July. †Gibbs, Arthur Gordon, *Storrington, Sussex.*
1889. Dec. †Gibson, William, *Bonhay Road, Exeter.*
1889. Jan. †Gilby, Charles, *Bath.*
1888. Oct. Gill, D., *Farleigh, Weston-super-Mare.*
1891. Nov. Gilliland, William John, *Architect*, 74, *Royal Avenue, Belfast.*
1888. Dec. Gladstone, J. H., PH.D., F.R.S., 17, *Pembridge Square, W.*
1888. Dec. Glen, A. W., 33, *Davies Street, Berkeley Square, W.*
1890. Mar. Godfrey, Robert, ASSOC.M.INST.C.E., *King's Heath, Worcestershire.*
1891. Jan. Going, Joseph A., M.R.C.S., B.A., M.O.H., *Fox Bay, West Falkland Islands, South America.*
1889. Nov. Goodyear, Herbert, ASSOC.M.INST.C.E., *Colchester, Essex.*
1889. Apr. Grant, Ogilvie, M.B., C.M.EDIN., M.O.H., *Queen Mary's House, Inverness.*
1888. Oct. Gray, Alexander, 25, *Greenhill Road, Hampstead, N.W.*
1890. Apr. Greatorex, Albert Daniel, *Municipal Offices, Southhampton.*
1888. Oct. Grellier, William, F.R.I.B.A., 6, *Queen Anne's Gate, S.W.*
1888. Oct. Groves, Joseph, B.A., M.D., F.G.S., *Carisbrooke, Isle of Wight.*
1890. Jan. Gruggen, William, D.P.H., 11, *Montpelier Road, Ealing, W.*
1888. Oct. Hall, E. T., F.R.I.B.A., 57, *Moorgate Street, E.C.*
1891. Mar. Hall, Watkin, ASSOC.M.INST.C.E., *Local Board Offices, College Road, Gt. Crosby, Lancashire.*
1891. Jan. Hamilton, Walter M., M.D., 456, *Liverpool Road, Patricroft, Lancashire.*

1888. Oct. HANCOCK, Charles, M.A.OXON, 2, *The Cloisters, Temple, E.C., and Reform Club, S.W.*
1890. Dec. HANSON, John, *Victoria Chemical Works, Wakefield.*
1889. Mar. HARDING, J. R., M.INST.C.E., *Epsom, Surrey.*
1889. Apr. HARE, C. J., M.D., F.R.C.P., *Berkeley House*, 15, *Manchester Square, W.*
1889. Mar. HARPUR, William, M.INST.C.E., *Town Hall, and* 197, *Severn Road, Cardiff.*
1890. Apr. HARRIS, Arthur Wellesley, M.R.C.S., L.S.A., D.P.H., M.O.H., *High Street, Southampton.*
1888. Oct. HARRIS, William John, M.R.C.S.E., L.S.A., F.R.MET.SOC., *Church House, Heene, Worthing.*
1888. Oct. HARRISSON, Thomas Harnett, ASSOC.M.INST.C.E., *Central Buildings, North John Street, Liverpool.*
1888. Dec. HARROLD, Miss C., 10, *Church Road, Edgbaston, Birmingham.*
1891. Nov. HASLAM, Dryland, Junr., P.A.S.I., 17, *Friar Street, Reading.*
1888. Oct. HASLAM, Lewis, *Ravenswood, near Bolton.*
1891. Apr. HASLIP, George Ernest, M.D., M.R.C.S., L.R.C.P., D.P.H., 3, *Southampton Street, Strand.*
1888. Oct. HAYWARD, C. F., F.S.A., F.R.I.B.A., 47, *Museum Street, Bloomsbury, W.C.*
1888. Oct. HEAD, Henry, 41, *Wimpole Street, W.*
1889. Feb. HEAD, Mrs. H., 41, *Wimpole Street, W.*
1888. Oct. HELLYER, S. Stevens, 21, *Newcastle Street, Strand, W.C.*
1889. Mar. HERBERT, Johnson, L.R.C.P., 3, *Belle Vue Terrace, Whitby.*
1888. Dec. HILL, Miss F. M. Davenport, 25, *Belsize Avenue, N.W.*
1888. Dec. HILL, Miss R. Davenport, 25, *Belsize Avenue, N.W.*
1889. Jan. HILL, Pearson, 6, *Pembridge Square, W.*
1891. Jan. HILL, PROF. A. Bostock, M.D., D.P.H., M.O.H., *Elmhurst, Olton, Birmingham.*
1888. Oct. HILL, Samuel, A.R.I.B.A., 16, *Russell Square, W.C.*
1888. Oct. HILL, William H., *Town Hall, Kensington.*
1891. Oct. †HILLS, Harry James, 27, *Park Road, New Wandsworth, S.W.*
1889. Mar. HODGETTS, E. A. Brayley, 39, *Redcliffe Square, South Kensington, S.W.*
1888. Oct. HODGSON, Shadworth H., 45, *Conduit Street, W.*
1891. July. HODGSON, William James, ASSOC.M.INST.C.E., *High Park, Near Ryde, Isle of Wight.*
1890. Apr. HOLBERTON, Henry Nelson, L.R.C.P., M.R.C.S., D.P.H., *East Moulsey.*
1888. Oct. HOLMES, Timothy, M.A., F.R.C.S., 18, *Great Cumberland Place, W.*
1888. Oct. HOLT, H. P., ASSOC.M.INST.C.E., F.G.S., *The Cedars, Didsbury, Manchester.*

1891. Nov. HOLROYDE, John, D.P.H., M.O.H., *Camden House, Chatham.*
1889. Mar. HOOLEY, Cosmo C., ASSOC.M.INST.C.E., *The Union Offices, Barton-upon-Irwell, Manchester.*
1889. Nov. HOOPER, Charles, M.R.C.S., M.O.H., *Aylesbury, Bucks.*
1889. Jan. †‡HOUGHTON, John, *Poplar Road, King's Heath, near Birmingham.*
1888. Oct. HOWARD, E., 84, *Upper Whitecross Street, E.C.*
1888. Oct. HOWE, George, 41, *Wigmore Street, W.*
1890. June. ‡HOY, Peter.
1888. Oct. †HUBBER, Frank, 85, *South Street, Exeter.*
1891. Oct. †HUNT, John W., *Maindee, Newport, Monmouth.*
1888. Dec. INGLIS, Cornelius, M.D., 1, *Albert Mansions, Victoria Street, S.W.*
1891. Nov. INGRAM, Matthew, *Manchester.*
1890. May. IVOR-MOORE, T., *R. E. Establishment, Barbadoes, West Indies.*
1890. Nov. †JAMES, Arthur Charles, *Borough Surveyor's Office, Cambridge.*
1889. May. JAMES, Charles Alfred, L.R.C.P., M.R.C.S., D.P.H., 24, *Cazenove Road, Stamford Hill, N.*
1891. Nov. JOHNSON, Samuel, M.D., C.M., M.O.H., *Stoke-on-Trent.*
1891. Oct. †KAY, Walter Robert, *Mount Sion House, Bury.*
1889. Mar. KEMPSTER, William Henry, M.D., M.O.H., *Oak House, Battersea.*
1888. Oct. KENNETT-BARRINGTON, SIR Vincent Hunter B.
1889. Dec. KIRBY, Oscar John, *Engineer and Manager Water Works, Batley.*
1889. Mar. KIRWAN, Surgeon-Major A., D.P.H., *St. Lucia, West Indies.*
1889. Mar. KYLE, Thomas W., M.D., D.P.H., M.O.H., *Measham, Atherstone.*
1888. Oct. LACY, William George, 82, *East Hill, Wandsworth.*
1889. May. LAING, R., M.R.C.S., L.R.C.P., F.R.MET.SOC., M.O.H., 29, *Waterloo Road, Blyth, Northumberland.*
1888. Dec. LAVENDER, Charles Henry Nalder, 2, *Ulster Terrace, Regent's Park, N.W.*
1888. Oct. LAWRENCE, Edwin, 10, *Kensington Palace Gardens, W.*
1888. Oct. LE GRAND, A., 100, *Bunhill Row, E.C.*
1888. Oct. LEMON, James, M.INST.C.E., F.R.I.B.A., F.S.I., F.G.S., *Lansdowne House, Southampton, (Palace Chambers, Westminster).*
1888. Oct. LEONARD, Hugh, 7, *Hanover Square, W.*
1888. Oct. LE ROSSIGNOL, Francis, F.S.I., 1, *Gresham Buildings, Basinghall Street, E.C.*, (29, *Penn Road Villas, Camden Road, N.*).
1889. June. LETTS, Thomas Hollins, 185, *Earls Court Road, South Kensington.*
1888. Oct. LINGARD, Alfred, M.R.C.S., L.S.A., D.P.H.CAMB., *St. Ermins Mansions, Westminster.*

1888. Oct. LINGARD, J. Edward, *Rodney Chambers, Derby.*
1888. Oct. LLOYD, Robert Samuel, 84 & 85, *Whitecross Street, E.C.*
1888. Oct. LLOYD, Thomas, *The Square, Winchester.*
1890. Mar. LOANE, Joseph, M.R.C.P.E., D.P.H., M.O.H., 98, *Tressillian Road, St. John's, S.E.*
1889. Apr. LOCKWOOD, Phillip Causton, M.INST.C.E., 1, *Gloucester Place, Brighton.*
1889. Jan. LOWE, Mrs. Thomas, *Solihull, Birmingham.*
1881. June. LYNDE, Frederick Charles, ASSOC.M.INST.C.E., 25, *Cross Street, Manchester, and* 9, *Victoria Street, S.W.*
1888. Oct. LYON, Washington, 85, *Asylum Road, Peckham, S.E.*
1888. Dec. MCARTHUR, A., M.P., 79, *Holland Park, W.*
1890. Oct. MCBEATH, William, M.A., M.D., D.P.H., 7, *Flora Place, Plymouth.*
1888. Oct. MACASSEY, L. Livingston, M.INST.C.E., 1, *Plowden Buildings, Temple, E.C.*
1888. Oct. MCINTOSH, James, *Duneevan, Oatlands Park, Weybridge.*
1888. Oct. ‡MACKENZIE, F. Morell, M.R.C.S., L.S.A., 10, *Hans Place, S.W.*
1891. Nov. MACKENZIE, William Leslie, M.A., M.B., C.M., D.P.H., COUNTY M.O.H., *Newton Stewart, N.B.*
1888. Oct. MACKEY, John B., 2, *Bouverie Street, Fleet Street, E.C.*
1888. Oct. MCKIE, Hugh Umsworth, M.INST.C.E., 11, *Victoria Street, Westminster.*
1888. Oct. MCMORRAN, Alexander, *Galloway House, Carlton Road, Putney.*
1890. Apr. MCNEILL, Roger, M.D., D.P.H., J.P., *County Medical and Sanitary Officer, Oban.*
1889. Mar. MACNAMARA, Charles Edward, L.K.Q.C.P.I., D.P.H., 11, *Cambridge Gardens, Notting Hill, W.*
1888. Oct. †MAGUIRE, William Robert, F.R.MET.SOC., 10, *Dawson Street, Dublin, and Town Hill, Dalkey, Co. Dublin.*
1888. Oct. MALTBY, Frederic Thomas, ASSOC.M.INST.C.E., *Surveyor's Office, Guildford.*
1890. July. MARSDEN, James Aspinall, M.R.C.S., L.S.A., D.P.H., M.O.H., *Standish, Wigan, Lancashire.*
1888. Dec. MARSHALL, John Ingham F., M.R.C.S., 28, *St. Saviourgate, York.*
1888. Dec. MARTINDALE, William, 10, *New Cavendish Street, W.*
1888. Oct. MARTINEAU, E. H., F.R.I.B.A., 30, *Weymouth Street, Portland Place, W.*
1888. Oct. MASON, Hugh H., M.R.C.S., *Abbey Lodge, Barking.*
1889. Nov. ‡†MASSEY, Joseph Bennett, 64, *Burns Street, Burnley, Lancaster.*
1888. Oct. MATHEWS, J. Douglass, F.R.I.B.A., F.S.I., 11, *Dowgate Hill, E.C.*
1888. Oct. †MAWBEY, E. G., ASSOC.M.INST.C.E., *Borough Engineer and Surveyer, Town Hall, Leicester.*

1888. Oct. Melissenos, G. C. A. Melisurgo, assoc.m.inst.c.e., *Palazzo Cocozzo*, 76, *Via Poerio, Naples.*
1888. Oct. †Metcalf, John W., 31, *Tamworth Road, Ashby-de-la-Zouch.*
1891. Nov. Metcalfe, James, 5, *Nether Hall Road, Doncaster.*
1888. Oct. Middleton, Reginald E., m.inst.c.e., m.i.m.e., 17, *Victoria Street, S.W.*
1888. Oct. Mineard, George Edward, f.r.h.s., 70, *Philbeach Gardens, Earl's Court, S.W.*
1891. Dec. Mitchell, Robert, *Chief Sanitary Officer, Cape Town, South Africa.*
1888. Oct. Mocatta, F. D., 9, *Connaught Place, W.*
1888. Oct. Montagu, Samuel, 12, *Kensington Palace Gardens, W.*
1888. Oct. Moore, J. H., *St. Michael's Lodge, Bournemouth.*
1891. Dec. More, James, Jun., assoc.m.inst.c.e., f.r.m.s., 49, *Orlando Road, Clapham, S.W.*
1890. Mar. Morgan, William Pringle, b.a., m.b., b.ch., d.p.h., *Hardis House, Seaford.*
1891. May. Morgan, William Barlow, assoc.m.inst.c.e., *Surveyor, Weymouth.*
1889. July. Morison, John, m.d., d.p.h., *Victoria Street, St. Albans.*
1891. Oct. †Morley, Edwin, *Town Hall, Walthamstow.*
1888. Oct. †Morley, J. G., assoc.m.inst.c.e., *Town Hall, Stratford, E.*
1891. Jan. Morris, Albert, m.r.c.s., l.r.c.p., m.o.h., *Post Office Buildings, Southend.*
1889. May. Morris, Pryce Jones Langford, m.r.c.s., l.r.c.p., m.o.h., *Halesworth, Suffolk.*
1888. Oct. Mouat, F. J., m.d., 12, *Durham Villas, Kensington, W.*
1888. Oct. Mouat, Surgeon-General J., c.b., f.r.c.s., 108, *Palace Gardens Terrace, W.*
1888. Oct. Mumby, B. H., m.d., m.r.c.s., m.o.h., *Portsmouth.*
1889. Apr. Munce, James, assoc.m.inst.c.e., *Town Hall, Belfast.*
1889. Dec. Munday, Major Henry, 23, *Oakley Square, N.W.*
1889. Apr. Murphy, Francis Henry Swinton, m.d., d.p.h., *Royal Arsenel, Woolwich.*
1889. Jan. Myers, Brigade-Surgeon A. B. R., m.r.c.s., l.s.a., 43, *Gloucester Street, Warwick Square, S.W.*
1888. Oct. Nanson, Tom, 9, *Park Crescent, Stockwell Park Road, S.W.*
1888. Nov. Nash, Brigade-Surgeon William, m.d., 18, *Victoria Street, Westmister, S.W.*
1889. May. Nasmyth, Thomas Goodall, m.b., c.m., d.p.h., f.r.s.e., *Cowdenbeath, Fife.*
1889. Mar. Nelson, E. M., *Hanger Hill House, Ealing.*
1888. Oct. Nelson, George H., *The Lawn, Warwick.*
1888. Oct. Newton, Edward, f.r.c.s., 85, *Gloucester Place, Hyde Park, W.*
1888. Oct. Nicol, W. E., *Ballogie, Aboyne, Aberdeen.*

1888. Oct. †Nichols, H. Bertram, ASSOC.M.INST.C.E., *Grosvenor Chambers, Corporation Street, Birmingham.*
1890. Dec. Nunn, F. C., ASSOC.M.INST.C.E., *Eastnor, Sydenham Hill, Surrey.*
1888. Oct. Page, Herbert Markant, M.D., D.P.H.CAMB., M.R.C.S., 16, *Prospect Hill, Redditch.*
1888. Oct. Pagliardini, T., 21, *Alexander Street, Westbourne Park, W.*
1889. May. Parker, G. R., M.R.C.S., L.R.C.P., M.O.H., 34, *King Street, Lancaster.*
1889. Mar. Parker, John, ASSOC.M.INST.C.E., 42, *Dryden Street, Nottingham.*
1890. Mar. †Parker, John, ASSOC.M.INST.C.E., *City Engineer, Hereford.*
1888. Oct. Parkes, Miss P., 8, *Grove Road, Surbiton, S.W.*
1888. Oct. Parsons, H. Franklin, M.D., *Local Government Board, Whitehall, S.W.*
1889. Mar. Partridge, Thomas, M.R.C.P.I., M.K.Q.C.S.I., L.S.A., M.O.H., *Stroud, Gloucester.*
1889. May. Patten, Charles Arthur, L.R.C.P., M.O.H., *Ealing.*
1888. Oct. Pattinson, S., *Ruskington, Sleaford, Lincoln.*
1888. Dec. Peake, Francis, *The Waldrons, Croydon.*
1888. Dec. Peel, Edmund, *Brynfys, Ruabon, North Wales.*
1888. Oct. †Phillipson, Burton R., *Baggot Street, Dublin.*
1891. Nov. Pilley, John J., 2, *Malfort Road, Denmark Hill, S.E.*
1890. Oct. †‡Poggio, Eloi John, 20, *Marylands Road, Harrow Road, W.*
1888. Oct. Powell, George Thompson, *Rotherwood, Sydenham Hill,* (28 *and* 29, *St. Swithin's Lane, E.C.*).
1888. Oct. Powell, J., 19, *Castle Street, Liverpool.*
1888. Dec. Priestly, Mrs. Eliza, 17, *Hertford Street, Mayfair.*
1888. Oct. Pritchett, G. E., F.S.A., F.R.I.B.A., *Oak Hall, Bishop's Stortford,* (1, *Hanway Place, Oxford Street, W.*).
1888. Oct. Pullar, Robert, J.P., F.R.S.E., *Tayside, Perth.*
1888. Oct. Pullin, T. H. S., M.D., F.R.C.S., F.S.A., *Sidmouth, Devon.*
1888. Oct. Purnell, W. J., *Vincent Row, Vincent Street, Westminster.*
1888. Oct. Purnell, E. W., *Vincent Row, Vincent Street, S.W.*
1888. Oct. Quain, Sir R., M.D., F.R.S., 67, *Harley Street, W.*
1889. Nov. †‡Radcliffe, Joseph, F.R.MET.SOC., *The Waterworks, Todmorden, Lancaster.*
1890. Nov. Radford, John Charles, ASSOC.M.INST.C.E., *Surveyor,* 113, *High Street, Putney.*
1888. Oct. †Radford, W. H., ASSOC.M.INST.C.E., A.R.I.B.A., *Pelham Chambers, Angel Row, Nottingham.*
1889. Mar. †Railton, James, *Town Hall, Lower Edmonton.*
1890. Apr. Rainger, Charles Henry, 9, *Bath Place, Cheltenham.*
1889. Mar. Read, Richard, ASSOC. M. INST. C.E., *City Surveyor, Gloucester.*
1888. Nov. Reynolds, Mrs. Russell, 38, *Grosvenor Street, W.*

1890. Mar. Rhodes, John William, 3, *Clifford's Inn, Fleet Street, E.C.*
1888. Oct. Ridings, H. Sadleir, M.A., M.INST.C.E., *Care of H. S. King & Co.*, 65, *Cornhill, E.C.*
1888. Oct. Roberts, Frederick F., M.D., 102, *Harley Street, W.*
1890. Jan. Roberts, Richard Lawton, M.D., D.P.H.CAMB., M.R.C.S., L.S.A., *Ruabon, North Wales.*
1888. Dec. Robins, Edward, 22, *Conduit Street, W.*
1891. Mar. Roche, Antony, M.R.C.P.I., L.R.C.S.I., L.M., *Professor of Hygiene*, 72, *Harcourt Street, Dublin.*
1888. Dec. Roe, Surgeon-Major, E. A. H., 17, *Whitehall Place, S.W.*
1889. Apr. Rogers, George Arthur, M.R.C.S.E., L.S.A., M.O.H., 404, *Commercial Road, E.*
1888. Oct. Roth, W. M.D., 6, *Kaizer Wilhelm Platz, Dresden, N.*
1891. Mar. Royle, Stanley Arthur, *City Surveyor's Office, Manchester.*
1888. Oct. Russell, Hon. Lady Agatha, *Pembroke Lodge, Richmond Park, Surrey.*
1891. Nov. †Saise, Alfred James, *Stapleton, Bristol.*
1889. Mar. Sandell, Henry W. Adrian, M.R.C.S., M.O.H., *Leighton Buzzard.*
1889. Mar. Schofield, Gerald, M.R.C.S., L.R.C.P., D.P.H., *Durham House, Bournemouth.*
1888. Oct. Scott, Bowes, *Broadway Chambers, S.W.*
1891. Nov. Scott, Conway, *Executive Sanitary Officer, Town Hall, Belfast.*
1889. Mar. Scott, Hugh Hamilton, ASSOC.M.INST.C.E., *Town Hall, Hove, Brighton.*
1888. Oct. Scott-Moncrieff, W. D., M.I.M.E., 86, *Newman Street, W.*
1888. Oct. Scriven, J. Barclay, M.R.C.S., 95, *Oxford Gardens, North Kensington.*
1888. Dec. Searles-Wood, Herbert D., F.R.I.B.A., 157, *Wool Exchange, E.C.*
1889. Jan. Selby, Prideaux, *Koroit, North Park, Croydon.*
1889. Mar. Sellers, William, Junr., M.D., M.O.H., *Bank House, Radcliffe, Manchester.*
1889. Mar. Shadwell, St. Clair B., L.R.C.P., M.R.C.S., M.O.H., *Lynhurst, Walthamstow.*
1889. Mar. Shaw, Charles Knox, L.R.C.P., M.R.C.S., 19, *Upper Wimpole Street, W.*
1889. Apr. Shaw, Josephus, M.R.C.S., L.S.A., M.O.H., 151, *Lower Road, Rotherhithe.*
1891. Oct. Shelbourn, Michael, *Architect and Surveyor, Belvoir, Grantham.*
1891. Nov. Shimeld, James, L.R.C.P. and S.E., M.O.H., *Salisbury House, Ilford.*
1889. Mar. Shirtliff, Edward Matthew, M.D., M.O.H., *Elm Side, Kingston-on-Thames.*

1889. Jan. SHONE, Isaac, ASSOC. M. INST. C. E., *Gt. George Street Chambers, S. W.*
1888. Oct. SHONKSMITH, John Henry, *Micklegate, York.*
1888. Oct. SILLAR, W. C., *St. James' Lodge, Kidbrooke Park Road, Blackheath, S.E.*
1888. Dec. SIMPSON, William John, M.D., D.P.H.CAMB., *Health Officer, Calcutta.*
1888. Oct. SIORDET, James Lewis, M.B., F.R.C.P., *Mentone, Alpes-Maritimes, France.*
1888. Oct. SKRINE, Henry Duncan, *Claverton Manor, Bath.*
1888. Oct. SMEATON, J., 56, *Great Queen Street, Lincoln's Inn Fields, W.C.*
1889. June.‡†SMITH, Charles Chambers, *Surveyor's Office, Dalton-in-Furness.*
1888. Oct. SMITH, Percival Gordon, F.R.I.B.A., *Highfield, Stonebridge Park, Willesden.*
1888. Oct. SMITH, R. W., *Mount Rundell, Harborne, Birmingham.*
1888. Oct. SMITH, Thos. Fredk. H., F.R.C.S., L.S.A., *Farningham, Kent.*
1889. Feb. SMITH, T. V., 111, *Grosvenor Road, S.W.*
1889. Mar. SMITH, William Howard, ASSOC.M.INST.C.E., *City Surveyor, Carlisle.*
1889. Jan. SNELL, Alfred, W., A.R.I.B.A., 1, *Park Road, Wimbledon.*
1889. Apr. SOUTHAM, Arthur, ASSOC.M.INST.C.E., 60, *Old Town, Clapham.*
1889. Mar. SQUANCE, Thomas Coke, M.D., F.R.MET.SOC., M.O.H., 4, *Beauclerc Terrace, Sunderland.*
1888. Oct. STAINTHORPE, W. Waters, M.D., D.P.H.EDIN., *Saltburn-by-the-Sea.*
1888. Oct. STANSFIELD-BRUN, J., F.R.I.B.A., *District Surveyor, Bradford-on-Avon.*
1889. Apr. STEEL, William D., M.D., M.O.H., D.P.H., *Neville Street, Abergavenny.*
1889. Mar. STEEVES, George Walter, B.A., M.D., M.O.H., 53, *Parkfield Road, Liverpool.*
1888. Oct. STEPHENSON, J. Gurdon L., ASSOC.M.INST.C.E., M.I.M.E., F.G.S., 6, *Drapers Gardens, E.C., and* 14, *Maxilla Gardens, Notting Hill, W.*
1890. Oct. STEVENS, Joseph Wallace, *Belph, Whitwell, near Chesterfield.*
1888. Oct. STEVENSON, Thos., M.D., 45, *Gresham Road, S.W.*
1889. Mar. STEWART, Alan, *Maldon, Essex.*
1889. Jan. STIFF, Ebenezer, *London Pottery, Lambeth.*
1888. Oct. STONE, W. H., *Lea Park, Godalming.*
1888. Oct. STREET, William C., A.R.I.B.A., ASSOC.INST.C.E., 7, *Victoria Street, Westminster, S.W.*
1888. Dec. SUDELEY, RIGHT HON. LORD, 7, *Buckingham Gate, S.W.*
1889. Jan. †SWAINSON, John Henry, M.S.A., ASSOC.M.INST.C.E., 59, *Hope Street, Wrexham.*

1889. Jan. †Swan, Harold, 114, *Trinity Road, Upper Tooting.*
1888. Dec. Swinburne, C. A., *Belgrave Mansions, Grosvenor Gardens, S.W.*
1891. Dec. Swinnerton, Robert Allen William, assoc.m.inst.c.e., m.i.m.e., *Bolarum, Dekkan, India.*
1889. Mar. Sykes, Matthew Carrington, l.r.c.p., m.r.c.s., d.p.h., *Barnsley.*
1888. Oct. †Tattersall, W., 90, *Arden Terrace, Accrington.*
1888. Oct. Taylor, Charles, m.r.c.s., l.s.a., 3, *Lorraine Road, Holloway, N.*
1889. Jan. Taylor, Wm. Fredk., m.d., m.r.c.s., l.s.a., *Brisbane, Queensland.*
1888. Oct. Teale, T. Pridgin, m.a., m.b., f.r.c.s., f.r.s., 38, *Cookridge Street, Leeds.*
1888. Oct. Thomas, Walter, assoc.m.inst.c.e., *Castleknowie, and Town Hall, Dover.*
1888. Oct. †Thomas, W. E. C., assoc.m.inst.c.e., *Eaglesbush, Neath.*
1889. Feb. Thompson, Thomas William, l.r.c.p., m.r.c.s., d.p.h., m.o.h., *Med. Inspr., Local Government Board, S.W.*
1891. Mar. Thompson, George William, assoc.m.inst.c.e., 36, *Wood Vale, Forest Hill, S.E.*
1890. June. †Thomson, Gilbert, 75, *Bath Street, Glasgow.*
1888. Oct. Thorneycroft, Lieut.-Col., *Tettenhall Towers, Wolverhampton.*
1888. Oct. Thornley, J. E., *Lyndon, Bickenhill, Birmingham.*
1890. Jan. Thresh, John Clough, m.b., b.s., d.sc., f.i.c., f.c.s., m.o.h., *Chelmsford.*
1889. Jan. Thring, Right Hon. Lord, k.c.b., f.r.g.s., 5, *Queen's Gate Gardens, S.W.*
1889. July. Thursfield, W. N., m.d., d.p.h., m.o.h., *Shrewsbury.*
1888. Dec. Titmas, William, 34, *Grafton Street, W.C.*
1888. Oct. Travers, William, m.d., f.r.c.s., 2, *Phillimore Gardens, W.*
1888. Dec. Trew, J. Fletcher, 12, *Clarence Street, Gloucester,* (22, *Broad Street, Bristol*).
1889. Nov. Tripe, John W., m.d., m.r.c.s., m.o.h., f.r.met.soc., *Town Hall, Hackney.*
1888. Oct. Tyndale, Walter Clifford, assoc.m.inst.c.e., *Horse Guards, Whitehall, S.W.,* (*St. Stephen's Road, Ealing*).
1889. Mar. Underhill, A. S., m.b., b.a., m.r.c.s., d.p.h., *Great Bridge, Tipton.*
1888. Oct. Valon, William A., assoc.m.inst.c.e., 140, *Temple Chambers, Temple Avenue, E.C.*
1889. Nov. Waddy, Henry Edward, f.r.c.p., d.p.h.camb., *Rhossili, Brunswick Road, Gloucester.*
1888. Oct. Wakefield, Miss E. M., *Broughton, Longdon, Rugely.*
1888. Oct. Wallace, William, 27a, *Old Bond Street, W.*
1890. Oct. †‡Wallis, Arthur Gray, *Care of West of Scotland Sanitary Association, 75, St. George's Place, Glasgow.*

1888. Oct. WALLIS, H. Sowerby, F.R.MET.SOC., 25, *Northwood Road, Highgate, N.*
1890. Apr. WALLIS, Isabel White 49, *Clifton Hill, St. John's Wood, N. W.*
1891. Nov. WARD, Arthur W., *Lisburn, Merton Road, Southsea.*
1891. Dec. WATSON, John Duncan, ASSOC. M. INST. C. E., *County Buildings, Aberdeen.*
1889. Jan. WELCH, Henry, M.D., B.SC., D.P.H.EDIN., *Public Health Offices, Blackpool.*
1888. Nov. WELLS, SIR T. Spencer, BART., M.D., F.R.C.S., 3, *Upper Grosvenor Street, W.*
1890. Nov. WHEELER, Charles, 12, *Dovecote Villas, Wood Green.*
1891. Nov. WHITAKER, William, B.A., F.R.S., F.G.S., 33, *East Park Terrace, Southampton, and* 28, *Jermyn Street, S. W.*
1888. Dec. †WHITCOMBE, Arthur, 48 *&* 50, *Howland Street, Fitzroy Square, W.*
1888. Oct. WHITE, William, F.S.A., F.R.I.B.A., 30*a*, *Wimpole Street, W.*
1889. Apr. WIGHTWICK, Fallon Percy, M.B., M.R.C.S., L.R.C.P., D.P.H., *St. John's, Horsleydown, S.E.*
1888. Oct. WILKINSON, W. B., *Northumberland Street, Newcastle-on-Tyne.*
1888. Oct. ‡WILKINSON, William, *Town Hall, Salford,* (20, *Aldren Street*).
1888. Oct. WILLIAMS, C. Theodore, M.A., M.D., F.R.C.P., F.R.MET.SOC., 2, *Upper Brook Street, W.*
1891. Dec. WILLIAMS, Roscoe A., M.D., *State Board of Health, Olathe, Kansas, U.S.A.*
1889. Dec. WILLIAMS, William, M.A., M.B., D.P.H.OXON, M.R.C.S., L.S.A., *The Royal National Hospital, Ventnor.*
1889. Apr. WILLIS, George, L.F.P.S.G., M.O.H., *Clifton House, Bailieston, Glasgow.*
1888. Oct. †WILSON, J. B., *Court House, Cockermouth.*
1888. Oct. WITHERS, J. B. Mitchell, F.R.I.B.A., 73, *Surrey Street, Sheffield.*
1888. Oct. †‡WITTS, J. W., M.S.E., *Borough Engineer's Office, Leeds.*
1888. Oct. WOOD, Jacob, *Highbury Park, N.*
1888. Nov. WOOD, William, M.D., 99, *Harley Street, W.*
1889. Mar. WOODMAN, John, M.D., F.R.C.S., M.O.H., *Southernhay, Exeter.*
1888. Oct. WOODWARD, Edward Francis, 43, *Southwell Street, Bristol.*
1889. Jan. †WORTH, John Edward, ASSOC.M.INST.C.E., F.R.MET.SOC., *Coombes Croft House, High Road, Tottenham.*
1888. Oct. WYNDHAM, REV. Francis M., M.A.OXON, *St. Charles College, St. Charles Square, W.*
1889. May. YARROW, George Eugene, M.D., M.O.H., *Oakley House,* 317, *City Road, E.C.*
1888. Oct. YUILL, W., ASSOC.M.INST.C.E., 3, *Fenchurch Avenue, E.C.*

ASSOCIATES (Assoc. San. Inst.)

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

1888. Oct. ‡Abrams, Henry.
1889. Nov. ‡Adams, Albert E., *Local Board Offices, Wood Green.*
1888. Oct. ‡Adams, H. J., 25, *Coleford Road, Wandsworth.*
1888. Oct. Adams, Miss Rose (Ladies' Sanitary Association), 22, *Berners Street, Oxford Street, W.*
1889. Jan. ‡Allen, William Henry, 22, *Moira Street, Cardiff.*
1890. Nov. ‡Amor, Alfred, *Octagon Chambers, Nelson Street, Bath.*
1888. Oct. ‡Amor, Daniel C., 39, *Shirley Road, Freemantle, Southampton.*
1889. May. ‡Anderson, Tom, 32, *Harrington Street, Hampstead Road, N.W.*
1890. July. Annett, William Fenn, 5, *Church Street, Kensington.*
1891. Apr. ‡Ashdown, Thomas, 38, *Upper Garden Street, Westminster, S.W.*
1889. July. ‡Bailey, William, 74, *Wilmslow Road, Withington, Manchester.*
1889. June. ‡Bainton, John, *Scunthorpe, Doncaster.*
1889. Apr. Baker, William, 2, *Chetwyad Road, Lawrence Road, Southsea.*
1890. Feb. ‡Balster, Herbert, *Town Hall, Margate.*
1888. Oct. Bamlett, Adam Carlisle, *Thirsk, Yorkshire.*
1889. Jan. ‡Barfoot, James, 30, *Fawcett House, Kennington Oval.*
1888. Oct. ‡Barron, John, 81, *Landor Road, Stockwell, S.W.*
1891. Feb. ‡Bartlett, William John, 50, *Cumming Street, E.C.*
1888. Oct. ‡Bascombe, H. C., *Wallasey Local Board, Egremont, Cheshire.*
1889. June. ‡Bassett, William Joshua, 16, *Elizabeth Street, Eaton Square, S.W.*
1890. Apr. ‡Baxter, Frank E., 374, *Kennington Road, S.E.*
1888. Oct. ‡Baxter, John, 374, *Kennington Road, S.E.*
1889. Jan. ‡Beck, William Coker, *Hastings.*
1891. Dec. ‡Beech, James, *Ivy Cottage, Brownhills, Tunstall.*
1889. June. ‡Birch, John Ernest William, 107, *Cobden Road, South Norwood, S.E.*
1890. May. ‡Bird, William Fred., *The Island, Midsomer Norton.*
1890. July. ‡Bishop, William F., 8, *Francis Place, Nine Tree Hill, Bristol.*
1888. Oct. ‡Black, Andrew E., 57, *Academy Street, Inverness, N.B.*
1891. May. ‡Blackman, Henry, *Catsfield, Battle.*
1888. Dec. Blake, E. T., M.D., 47, *Seymour Street, Hyde Park, W.*
1891. Mar. ‡Blake, H. K., *Engineer's Office, Guildhall, E.C.*
1889. June. Bland, William, 420, *Liverpool Road, Patricroft.*
1890. May. ‡Bond, George.
1890. Jan. ‡Bond, William Henry, *St. Giles Board of Works, Holborn, W.C.*

1888. Oct. ‡Bostel, G. Stanford, 18, *Duke Street, Brighton.*
1891. April. ‡Bourne, Edward, 256, *High Street, Cheltenham.*
1889. Jan. ‡Bovey, William T., *Acton, W.*
1889. July. ‡Bowyer, Harry David, *Park Street, Slough.*
1888. Oct. ‡Boyce, W., 117, *High Street, Poplar, E.*
1888. Oct. Boyd, Richard Wade, 105, *New Bond Street, W.*
1891. Mar. ‡Braley, Francis, 18, *Woodbine Avenue, Leicester.*
1888. Oct. Breeze, John, *Poynton Lodge, Wellington, Salop.*
1891. Feb. ‡Brindle, Thomas, 12, *Ashfield Road, Chorley.*
1888. Oct. Broad, Clement B., *Stamford Brook Lodge, Ravenscourt Park, W.*
1891. April. ‡Broadhead, S., 24, *St. James' Street, Humberstone Gate, Leicester.*
1890. Nov. ‡Brook, John, *Albany Place, Stratford-on-Avon.*
1890. Nov. Broughton, Thomas, *Garston, near Liverpool.*
1890. Nov. ‡Brown, Edward, *Local Board Offices, Burgess Hill.*
1891. April. ‡Brown, George William, *Serg.-Maj. R.E.*, 3, *Marle Hill Villas, Cheltenham.*
1891. Feb. ‡Brown, John, 8, *Paddock, Whitby.*
1888. Oct. ‡Brown, R. Railston, 1, *Blenheim Terrace, Bridlington Quay, Yorkshire.*
1888. Oct. ‡Brown, W. E., 19, *Havelock Road, Hastings.*
1890. Jan. ‡Bryan, George John, 4, *South Norwood Hill, S.E.*
1891. June. ‡Bubb, John Thomas, 38, *Albert Park, Bristol.*
1888. Oct. Buchan, W. Paton, *Fairyknowe, Cambuslang, Lanarkshire, N.B.*
1888. Oct. Buckeridge, Walter, 5, *Alexander Street, Westbourne Park, W.*
1888. Oct. ‡Bugler, W. J., *Alpha House, Putney.*
1888. Dec. Burn, Robert G. N., 24, *Charing Cross, S.W.*
1888. Oct. Burroughs, S. M., *Snow Hill, E.C.*
1889. Oct. ‡Burscough, Frederick Peter, 42, *Belmont Avenue, Blackpool.*
1889. May. ‡Butland, R. J., *Town Hall, Brighton.*
1891. Mar. ‡Butler, Walter, *Fareham, Hants.*
1891. April. ‡Burton, W. H., 59, *Avenue Road, North Finchley.*
1890. Apr. ‡Butterworth, Arthur, *Board of Works, Maxey Road, Plumstead.*
1889. Feb. ‡Buxton, Anthony, *Carisbroke, Isle of Wight.*
1890. Feb. ‡Callaway, Albert Henry, *Grosvenor Villa Evesham Place, Stratford-on-Avon.*
1891. June. ‡Carter, Alfred, 71, *Leighton Road, Kentish Town.*
1891. July. ‡Cary, Aquilla S., 1, *Lily Villas, New Southgate.*
1888. Oct. ‡Catten, Joseph H., 32, *Exeter Street, Sloane Street, S.W.*
1891. Nov. Challoner, William, *Blackpool, Lancaster.*
1889. Apr. ‡Chaney, William H., 36, *Essex Street, Strand.*
1891. Nov. ‡Cheshire, Alfred, 64, *Church Street, Rugeley.*
1889. Feb. ‡Christie, David, 76, *Brunswick Avenue, Hull.*
1888. Oct. ‡Clarkson, Joseph, *Churchfield Terrace, Batley, Yorks.*

1889. Jan. ‡Clayton, Edward, *Mansfield, Notts.*
1890. June. ‡Clifton, Henry Chas., 50, *Porchester Road, Bayswater.*
1888. Oct. ‡Cobham, C., *The Shrubbery, Gravesend.*
1888. Oct. Cobham, G. R., 3, *Edwin Street, Gravesend.*
1890. Apr. ‡Cockburn, Henry Mace, 1, *Estelle Road, Mansfield Road, Gospel Oak.*
1891. Jan. ‡Cole, A. C., 21, *West Street, Dorking.*
1891. July. ‡Collins, Henry Beale, 16, *Little Grosvenor Street, W.*
1891. Dec. ‡Collyer, C., *Uttoxeter, Stafford.*
1891. Nov. ‡Cook, James, *Warton, near Carnforth.*
1890. Dec. ‡Cook, William Gough, 395, *Kennington Road, S.E.*
1889. Feb. ‡Cooper, William George, *Sanitary Inspector, Bournemouth.*
1890. Jan. ‡Copestick, George Christopher, 1, *Arboretum Square, Arboretum Street, Derby.*
1890. Jan. ‡Corbett, Richard Lawrence, *Oakengates, Salop.*
1889. Jan. ‡Cordon, Robert Curtis, *Hillside Cottage, Duffield, Derby.*
1891. June. ‡Corp, James, 16, *Harrington Square, N.W.*
1890. June. ‡Corrick, Alfred.
1889. Mar. Cottle, Arthur Thomas, *Selly Oak, Near Birmingham.*
1890. Mar. Court, Thomas Henry, 103, *King's Road, Peckham,* (140, *Tanners Hill, Deptford*).
1891. Oct. ‡Cowderoy, John Tatem, *Kidderminster, Worcester.*
1889. Jan. ‡Cowper, Joseph, 22, *Talma Road, Brixton.*
1888. Oct. Cowper-Coles, Cowper Bickerton, 95, *Wigmore Street, W.*
1891. Jan. ‡Coxill, George E., 15, *Kentish Town Road, N.W.*
1891. June. ‡Crane, Joseph, 93, *Trafalgar Road, Gorleston, Great Yarmouth.*
1891. Feb. ‡Crane, William Henry, 14, *Colonial Street, Hull.*
1890. June. ‡Crocker, Thomas William, *Vestry Hall, Pancras Road, N.W.*
1889. June. ‡Crockwell, George E., 14, *Church Street, Ilfracombe.*
1888. Oct. ‡Croghan, Thomas Andrew, 37, *Devonshire Gardens, Buxton.*
1891. Mar. ‡Cronk, Wm. Robert, *Cranford House, Cranford, Hounslow.*
1890. Feb. ‡Crosse, Hammond William, *St. Mary's Cottage, Putney.*
1890. Feb. ‡Crossley, James, 1, *Maurice Street, Bolton Road, Pendleton.*
1890. Jan. ‡Crowther, William Christopher, 51, *Hind Street, Stockton-on-Tees.*
1891. June. ‡Culling, James George, *The Terrace, Swaffham.*
1891. Feb. ‡Culver, Thomas Henry, 34, *Bradstone Avenue, Folkestone, Kent.*
1891. June. ‡Dale, Duncan, 312, *Camberwell New Road, S.E.*
1891. Dec. Dalton, George, *Histon Road, Cambridge.*
1889. June. ‡Daltry, John, *Sanitary Inspector, Wellington, Salop.*
1888. Oct. ‡Darley, George, 49, *St. Marks Street, Woodhouse, Leeds.*

1890. May. ‡Davies, T. Lane, 1, *Albert Square, E.*
1891. June. ‡Dawson, John Marshall, 93, *Malpas Road, Brockley.*
1890. June. ‡Dawson, William, 6, *Brooklands Road, Birkenhead.*
1890. Mar. ‡Dean, Samuel Saunders, *Hugglescote, Ashby-de-la-Zouch.*
1890. June. ‡Dee, Thomas George, 17, *Grosvenor Road, S.W.*
1888. Dec. Densham, Charles A., 42, *Wellington Road, St. John's Wood, N.W.*
1890. May. ‡Dick, William, *Kirknewton, Midlothian.*
1891. Dec. ‡Docking, Frederick Reynolds, 56, *George Street, Croydon.*
1889. Apr. Douglas, The Hon. J. *Thursday Island, Torres Strait, Queensland.*
1890. Jan. Dover, John Henry, 13, *King Street, Kensington Square, W.*
1891. Nov. ‡Dowsing, Alfred, 2, *Mawney's Villas, Romford.*
1889. Jan. ‡Drake, W. Medley, *Kirkheaton, Huddersfield.*
1889. June. ‡Duck, Albert George, 211, *Tooley Street, Horsleydown, S.E.*
1890. Feb. ‡Dunbar, David.
1891. Nov. ‡Duthie, Alexander, 93, *High Street, Brechin, N.B.*
1889. Feb. ‡Dyer, Samuel, 3, *Wellington Road, Bridlington Quay.*
1891. June. ‡Dyke, Alfred William, *St. John's Wharf, Wandsworth Bridge, Fulham.*
1889. Jan. ‡Dyson, John Henry, *Park Terrace, Thornhill, near Dewsbury.*
1891. June. ‡Earwicker, John Charles, 3, *Clarence Terrace, St. Mary's Grove, Richmond, S.W.*
1889. Mar. ‡Easton, Charles Joseph, *Coombes Croft House, High Street, Tottenham.*
1891. Nov. ‡Eccles, William Henry, 98, *Kay Street, Darwen.*
1889. Jan. ‡Edmonds, William H., *Vestry Hall, Pancras Road, N.W.*
1890. Nov. Edwards, John, 16, *Gladstone Street, St. George's Road, S.E.*
1888. Oct. ‡Emptage, Daniel, *Dane Hill Sanitary Works, Margate.*
1888. Oct. ‡Evans, John Evan, 137, *Weston Street, Tooley Street, S.E.*
1890. May. ‡Evington, Charles William, 12, *Bridlington Street, Hull.*
1888. Oct. ‡Fairchild, Samuel C. G., 569, *Wandsworth Road, Clapham, S.W.*
1891. Feb. ‡Fairey, Alfred Isaac, 5, *Tavistock Street, Covent Garden.*
1890. Mar. Finch, William, 44, *Mason Street, Kingston-upon-Hull.*
1889. Jan. ‡Fincher, John Gazeley, *Aldershot.*
1891. Nov. ‡Foad, Cephas, 34, *Gough Street, Poplar, E.*
1890. June. ‡Folland, John Percy, 22, *Liverpool Street, King's Cross.*
1888. Oct. ‡Fordham, Wm. Francis, *Hampton House, High Road, Kilburn.*
1890. May. ‡Forrester, William, *Headcorn, Ashford, Kent.*

1888. Oct. France, T. W. Chapman, 36, *Bristol Road, Edgbaston.*
1890. Jan. ‡Fulcher, George, *Rural Sanitary District, Rugby.*
1888. Oct. Gairdner, Prof. W. T., m.d., ll.d., *The University, Glasgow.*
1888. Nov. ‡Gardner, C. T., *Town Hall, Worthing.*
1888. Oct. ‡Garland, Wm., 12, *Higher Maudlin Street, Barnstaple.*
1888. Oct. Gass, John Bradshaw, a.r.i.b.a., 19, *Silverwell Street, Bolton.*
1889. June. ‡Gathercole, William Henry Joseph, *Engineer's Office, Guildhall, E.C.*
1890. Mar. ‡Gibson, John, *Health Offices, North Church Street, Sheffield.*
1889. Mar. ‡Gilbeart, John Joseph, 11 & 12, *Little Chester Street, Belgrave Square, W.*
1890. Jan. ‡Gillies, Neill, *Lochgilphead, Argyllshire, N.B.*
1891. June. ‡Gillespie, Rev. Charles George Knox, 2, *Darwin Terrace, Derby.*
1891. April. ‡Godsall, Henry John, *Park Road, Saltley, Birmingham.*
1888. Oct. ‡Goodwyn, Arthur Ayde, 34, *Church Road, Richmond, Surrey.*
1891. Feb. ‡Gough, Joseph, 7, *Malvern Terrace, St. Paul's Road, Tottenham.*
1891. Nov. ‡Grant, Alexander, *Town Hall, Chelsea.*
1889. Jan. ‡Grant, Walter, 18, *Gildredge Road, Eastbourne.*
1890. Nov. ‡Graves, Matthew Dodgson, 7½, *College Street, York.*
1891. July. ‡Green, Edward Albert, 16, *Rock Street, Bridgehouses, Sheffield.*
1891. Feb. ‡Green, William, 6, *Meredith Street, Clerkenwell, E.C.*
1889. June. ‡Greenwell, Allan, *Surveyor's Office, Frome.*
1888. Oct. Gribble, Miss Sarah C., 11, *Willswood Park, Torquay.*
1891. Feb. ‡Grigg, William Henry, 21, *Tadema Road, Chelsea, S.W.*
1890. June. Grinham, Philip Boys, *Tichborne Down, Alresford.*
1891. June. ‡Grivell, Elias James, 10, *Salisbury Road, Gloucester.*
1890. June. ‡Groom, William Edwin, 117, *Wells Street, Camberwell.*
1888. Oct. ‡Gunn, Alexander, 123, *King Street, Aberdeen.*
1890. Jan. ‡Hall, George Berringer, f.g.s., 10, *Waldemar Avenue, Fulham Road.*
1891. June. ‡Harper, Frank, 39, *Derby Road, Northampton.*
1889. June. ‡Harrison, George, 7, *Plymouth Terrace, Humberston, Leicester.*
1890. Feb. ‡Harrison, Henry, 5, *Beaconsfield Terrace, West Kensington.*
1891. Mar. ‡Harrison, Wm. Henry, *Health Offices, Sheffield.*
1888. Oct. ‡Harrison, Wm. L., 7, *Dock Street, Hull.*
1888. Oct. ‡Hart, W. S., 29, *Coley Hill, Reading.*
1891. Mar. ‡Hartnoll, Francis, 49, *St. Paul's Road, Burdett Rd. E.*
1891. Oct. ‡Hatton, Charles, 24, *Church Street, Hereford.*
1890. Jan. ‡Hay, Alexander, 56, *George Square, Glasgow.*

1888. Oct. ‡Head, Robert H., 7, *Upper Baker Street, N.W.*
1891. Nov. ‡Heaps, William, Junr., 28, *Parker Street, Chorley, Lancashire.*
1888. Oct. Hearn, Walter, 7, *Grove Terrace, Grove Park, Chiswick, and* 27, *Mecklenburgh Square, W.C.*
1888. Oct. ‡Hearne, William, *Buenos Ayres.*
1889. June. ‡Helsdon, Horace, 14, *St. Edmunds Terrace, Primrose Hill, N.W.*
1891. Feb. ‡Hennen, Alfred, 37, *Joseph Street, Gosport.*
1891. Nov. ‡Herbert, Harry, 3, *Charge Place, Stockton-on-Tees.*
1890. Mar. ‡Hills, Arthur Reginald, 24, *Harley Street, Bow, E.*
1888. Dec. ‡Hobbs, W. F., 36, *Melbourne Street, Stalybridge.*
1890. Mar. ‡Hodges, Albert, 57, *Hall Street, Blakenhall, Wolverhampton.*
1890. May. ‡Holland, Percy, *Fairstead Cottage, Newmarket.*
1889. June. ‡Holmes, William, 43, *Thornhill Street, Wakefield, Yorkshire.*
1889. June. ‡Hooper, Thomas Rowland, *Redhill, Surrey.*
1890. Jan. ‡Hooper, William, 4, *Lucas Road, St. John's Road, Penge, S.E.*
1888. Oct. Horncastle, Henry, *Chobham, Woking Station, Surrey.*
1891. Nov. ‡Horner, Benjamin Roper, 2, *St. Stephen's Terrace, West Bowling, Bradford, Yorks.*
1888. Oct. ‡Horrocks, Joseph, 10, *Union Street, Southport.*
1891. Nov. ‡Horsman, Charles Edwin, 8, *Bedford Square, Bishopwearmouth, Sunderland.*
1889. Jan. ‡Houghton, Robert Alfred, 5, *Springfield Road, Wimbledon.*
1890. Nov. ‡Hughes, Edward J., 102, *Camden Street, Birkenhead.*
1891. Nov. ‡Hughes, Walter, *Thompson Street, Bilston.*
1891. April. ‡Humphery, Joseph Paxton, 2, *Mark Terrace, Eastbourne.*
1890. Jan. ‡Imrie, Henry William, 28, *Parry Place, Plumstead.*
1890. Feb. ‡Ingram, William Jones, *Goldsworth Road, Woking.*
1891. Dec. ‡Inskip, Frederick Thomas, *Delhorne, Stoke-on-Trent.*
1890. Feb. Jacob, Oswald, *Sanitary Inspector, Feltham, Middlesex.*
1891. Feb. ‡Jackson, Henry James, 4, *Corn Street, Witney.*
1891. Oct. ‡Jackson, William, *Gate House, Shuttleworth, Bury.*
1891. Oct. ‡Jarvey, George, *Town Hall, Salford.*
1889. Feb. ‡Jasper, Robert Wevill, *Withersfield Road, Haverhill, Suffolk.*
1890. Jan. ‡Jellis, John, 188, *Uttoxeter Old Road, Derby.*
1889. July. ‡Jenner, Richard Messenger, *Parade Road, Sandgate.*
1891. Feb. ‡Johnson, H. Watts, 103, *Gurney Road, Stratford, E.*
1890. May. ‡Johnson, John William, 785, *Commercial Road, Limehouse, E.*
1890. Nov. ‡Johnson, Joseph Edward, *Town Hall, Hull.*
1891. Nov. ‡Johnson, Matthew, 31, *Palmer Street, Jarrow.*
1891. Feb. ‡Johnson, Stafford, 3, *Percy Road, Leytonstone.*
1891. April. ‡Jones, Charles Bristow, *Town Hall, Fulham.*

1890. June. Jones, John, 40, *Sydney Street, Chelsea.*
1890. Nov. ‡Jones, Julius Morris Wilson, 27, *Mornington Road, Bow, E.*
1889. June. ‡Jones, William, *Cemlyn, Dolgelly, Merioneth.*
1890. Mar. ‡Jours, William, *Gateshead.*
1890. Dec. ‡Jury, H. A., *North-East Lodge, Chelsea Bridge, Grosvenor Road, Pimlico, S.W.*
1888. Oct. ‡Keal, J., *Southview Hill Road, Sutton, Surrey.*
1888. Oct. ‡Kemsley, Jesse, 55, *Landcroft Road, East Dulwich.*
1891. June. ‡Kershaw, Edward Baxter, 115, *Wellfield Road, Streatham.*
1888. Oct. ‡Kiell, John, 103, *High Street, Barnstaple.*
1891. July. ‡King, Albert S. W., 27, *Solon Road, Brixton, S.W.*
1889. Feb. ‡King, Frederick William, *Heybridge, Maldon, Essex.*
1891. Feb. ‡Kirk, John Wright, *Ivy Villa, Park Road, Plumstead.*
1888. Oct. Kite, Charles, 31, *Barronsmere Road, East Finchley.*
1890. May. ‡Knight, Robert, junr., *Dunfermline, Fife.*
1889. Feb. ‡Knight, William Henry, 5, *Selborne Road, Wood Green, N.*
1889. June. ‡Lander, James, 19, *Millbank Street, Westminster.*
1888. Oct. ‡Lapworth, J., *Vestry Hall, Bethnal Green, E.*
1889. Nov. ‡Laurie, John, 14, *Poplars Avenue, Willesden Green.*
1889. July. ‡Layland, William Thomas, *Grimstone, King's Lynn.*
1891. Nov. ‡Lear, Charles F. E., *Alverstoke, Hampshire.*
1889. Jan. ‡Lear, James Walter, 122, *Southgate Road, N.*
1889. Mar. ‡Lee, James, 28, *Franchise Street, Rochdale.*
1888. Oct. ‡Legg, S. C., 117, *Powerscroft Road, Lower Clapton, N.E.*
1888. Dec. ‡Lennox-Clarke, A.
1891. Feb. ‡Lewis, Charles, *Witham, Essex.*
1889. Jan. ‡Lewis, Arthur, *Isham, Wellingborough.*
1888. Oct. ‡Lightfoot, Thomas, 80, *Vincent Square, Westminster.*
1890. May. ‡Lightfoot, William Charles, 20, *High Road, Knightsbridge.*
1890. Jan. ‡Lilly, William Gent, 5, *Whitcomb Street, W.C.*
1891. Feb. ‡Liscombe, Charles F., 24, *Bishop Street, Bristol.*
1890. Nov. ‡Little, William, 51, *Trafalgar Street, Carlisle.*
1891. July. ‡Lloyd, Christopher, 2, *St. Mark's Terrace, New Brompton, Kent.*
1890. Mar. ‡Lock, G. H., 64, *Richards Terrace, Routh, Cardiff.*
1891. July. ‡Locke, Walter Richard, *Bedford House, Aylesbury.*
1891. Jan. Longsdon, Ernest M., *Surveyor, Llundudno, Carnarvon.*
1891. Nov. ‡Lowry, James, *Bradmore, Wolverhampton.*
1889. Jan. ‡Lukes, Arthur Henry, *Town Hall, Gravesend.*
1890. Nov. ‡Lund, Clifton, 2, *Arbour Street, Southport.*
1888. Oct. ‡Lund, Jeremiah, *St. James's Vestry, Piccadilly.*
1888. Oct. ‡McDonald, A. L., 37, *George Street, Gipsy Hill, S.E.*
1888. Oct. MacIntosh, James, 38, *Langham Street, W.*
1889. July. Mackay, George Archibald D., Inspector of Cleansing, *Edinburgh.*
1889. Apr. Mackay, James John, 186, *Kensal Road, W.*

1890. Feb. ‡Maclennan, John, *Carnock House, Carnock, Dunfermline.*
1891. Nov. ‡Madin, William B., *Town Hall, Leek.*
1891. June. ‡Mager, Frederick Walter, *Surveyor's Office, Town Hall, Tiverton.*
1890. June. ‡Maguire, James, *Sanitary Inspector, Huddersfield.*
1890. May. ‡Malcolm, Alfred, *Clayton, near Manchester.*
1891. Nov. ‡Marsden, William Edward, 13, *Springfield Street, Darwen.*
1891. Oct. ‡Martin, William, Junr., *Glenburn, Carluke, N.B.*
1891. April. ‡Mason, Frederick William, 22, *Main Avenue, Bush Hill Park, Enfield.*
1890. Apr. Mason, Jonathan, 1, *Grove Terrace, Grove Road, Leytonstone.*
1891. Feb. ‡Mason, William Allinson, *Shildon, near Darlington.*
1888. Oct. ‡Mathias, H. D., 43, *Weldon Street, Walton, Liverpool.*
1891. Feb. ‡Matthews, William, *Kedleston, Derby.*
1889. Feb. ‡May, William H., *Inspector's Office, Guildhall, E.C.*
1891. Mar. ‡Mayne John William, *Wimbledon, Surrey.*
1888. Dec. Merrill, John, *Albany Road, Sheffield.*
1889. Jan. ‡Millard, William David, 1, *Elswick Villas, Ramsgate.*
1891. Oct. ‡Miller, Henry, *The Wilderness, Bracondale, Norwich.*
1891. April. ‡Mills, Walter Snephard, 38, *Chaplin Road, Willesden Green, N.W.*
1891. Feb. ‡Milne, George, *Ballater, Aberdeen.*
1890. Oct. ‡Milner, W., 18, *St. Paul's Road, Preston.*
1891. July. ‡Milner, Walter, 40, *Sackville Street, W.*
1891. April. ‡Miners, Richard Eustace, *Board of Works, Poplar, E.*
1888. Oct. ‡Minty, Samuel, *The Triangle, Bournemouth.*
1891. Mar. ‡Misselbrook, G. T., *Fareham, Hants,*
1890. Feb. Mitchell, Edward, 25, *St. Saviour's Road, Croydon.*
1891. Mar. Mitchener, Frederick Harry, 4, *Charles Street, Oxford Road, Islington.*
1888. Oct. Molineux, Walter Frank Yate, *Shifnal, Salop.*
1890. June. ‡Moody, Henry Fred, 26, *Cavendish Street, Gt. Grimsby.*
1891. Feb. ‡Moore, Arthur George, *Sundridge Workhouse, Sevenoaks, Kent.*
1889. Jan. ‡Morgan, Francis Robert, 25, *Ordnance Rd., St. John's Wood.*
1891. April. ‡Morris, G. John, *Garden Vale, Athlone.*
1891. April. ‡Mosley, Abraham, *care of E. Law, County Surveyor, Northampton.*
1891. Dec. ‡Moss, Samuel, *Williamson Street, Tunstall.*
1889. July. ‡Nettleton, Charles William, 16, *Winchester Terrace, Westminster, S.W.*
1891. Mar. ‡Nicholas, David, 256, *Essex Road, Canonbury, N.*
1888. Dec. Norris, Joseph, *Sunningdale, Surrey.*
1890. Mar. ‡Norrish, John Thomas, 9, *Cuthbert Road, Brighton.*
1890. May. ‡Nurcombe, Benjamin, 1, *Jasmine Terrace, Wurtemberg Street, Clapham.*

1890. June. ‡Nutley, Charles Vernon, 13, *Dalling Road, Hammersmith.*
1890. Oct. ‡Oliver, G., 14, *St. John's Road, Waterloo, Liverpool.*
1889. Mar. ‡Ollett, John Henry, *Sanitary Inspector, Eastbourne.*
1889. Nov. Ord, James, 11, *Portman Street, W.*, (41, *Upper George Street, W.*).
1891. Nov. ‡Outram, Mason, *Dronfield, near Sheffield.*
1888. Oct. Palliser, Christopher, *Northallerton.*
1890. Jan. ‡Palmer, Henry Arthur, *P. H. Office, N. Church Street, Sheffield.*
1891. June. ‡Paramor, Robert Walter, 16, *Randolph Gardens, Dover.*
1890. May. ‡Parham, John, junr., 120, *Powerscroft Road, Clapton Park, Hackney.*
1891. Dec. Parkinson, Herbert William, 11, *Gloucester Road, South Kensington.*
1889. Oct. ‡Parsons, William, *St. Luke's Vestry Hall, City Road, E.C.*
1890. May. ‡Pattison, William Phillip, 8, *Addison St., Sunderland.*
1891. June. ‡Peake, Thomas Jones, 61, *Wybunbury Road, Willaston, Nantwich.*
1891. June. Pearce, Frederick James, *Borough Surveyor's Office, Kingston-on-Thames.*
1888. Oct. Pearce, George Edward, *Dartford, Kent.*
1888. Oct. ‡Pearson, John, *Sanitary Inspector, Grace Hill, Folkestone.*
1891. June. ‡Pemberton, Oliver, 273, *Wheeler Street, Lozells, Birmingham.*
1890. June. ‡Perman, Edward, 3, *Railway St., Newport, Monmouth.*
1888. Nov. ‡Perry, Arthur, 45, *Townshend Road, St. John's Wood.*
1889. June. ‡Perry, Walter Harold, 10, *Berkeley Avenue, Bishopston, Bristol.*
1889. Feb. ‡Pettit, George Mackness, *Frederick Villa, Padua Road, Penge, S.E.*
1890. May. ‡Phillips, Henry, 56, *Campden Street, Campden Hill.*
1891. July. ‡Pilbeam, Francis Newcastle, 28, *Rosaville Rd., Fulham.*
1891. Oct. ‡Pool, Fred., *Industrial School, Mayson Street, Blackburn.*
1890. Jan. Poole, James, 2, *Trafalgar Place, Kensington.*
1888. Oct. ‡Potter, Ben, *Heathfield House, Broadway, Ealing.*
1889. Jan. ‡Potter, Thomas Wickford, *Estate Works, Thoresby Park, Ollerton, Notts.*
1889. Jan. ‡Poulson, Frederick Thomas, 11, *Hobury Street, Chelsea.*
1889. Feb. Powell, David Henry William, *Surveyor, Pontypool.*
1889. Jan. ‡Pratt, Joseph, 12, *Kirkdale, Sydenham.*
1889. Mar. ‡Press, William James, *Rose Villa, Abingdon Street, Burnham, Somerset.*
1891. Apr. ‡Proffitt, John T.
1888. Oct. Proger, John L., 11, *Cwrtiy-vie Road, Penarth, Cardiff.*
1888. Oct. ‡Rains, Joseph, *Kettering.*
1888. Oct. ‡Reavell, George, Jun., *Alnwick, Northumberland.*

1888. Oct. ‡Richards, Daniel, *Elwyn Villa, South Molton.*
1890. Apr. ‡Robertson, John Shirras, 4, *Belmont Street, Aberdeen.*
1890. Jan. ‡Robinson, John, 79, *Lavender Road, Clapham Junction.*
1891. July. ‡Roe, Edward Charles, Junr., *Rosenaw, Maswell Park, Hounslow, Middlesex.*
1888. Oct. ‡Rogers, Richard, *Maes Helew, Carnarvon.*
1891. June. ‡Rossiter, Robert Herbert, 15, *Sloane Terrace, Sloane Street, Chelsea, S.W.*
1891. Nov. Rowe, William Thomas Ferdinand, *Sanitary Engineer,* 41, *Old Town Street, Plymouth.*
1891. Nov. ‡Rowland, Arthur, 5, *Cambridge Street, Hull.*
1890. May. ‡Ruscoe, Ernest Henry, 6, *Great Castle Street, Regent Street, W.*
1889. July. ‡Ryder, Albert Thomas, *Dudley Villa, Foster Hill Road, Bedford.*
1889. Jan. ‡Sadleir, Richard J., 6, *Cornford Grove, Balham.*
1890. Dec. ‡Saise, Alfred John, *Fishponds, Stapleton, Bristol.*
1888. Oct. ‡Salter, Thomas, 2, *King's Road, St. Leonards-on-Sea.*
1890. May. ‡Saunders, Percy, 46, *Jarvis Road, South Croydon.*
1890. June. ‡Savory, Charles, 6, *Holford Place, W.C.*
1891. Apr. Schneider, Carl Ferdinand, 14, *Cavendish Road, Regent's Park, N.W.*
1891. Feb. ‡Scott, Margaret Eleanor, 133, *Abbey Road, South Hampstead, N.W.*
1888. Oct. Sedgwick, Sydney, 10, *Mortimer Street, Cavendish Square, W.*
1891. Nov. ‡Senior, John Sidney, 3, *Queen's Road, Gosport.*
1888. Oct. Sevenoaks, William, *Acre House, Windsor.*
1888. Oct. ‡Shadrake, W. A., 8, *Hind Street, Stainsby Road, Poplar, E.*
1890. Feb. ‡Shaw, Peter, *Selham Cottage, Selham, Petworth, Sussex.*
1891. Feb. ‡Shaw, W. B., 19, *Newcomen Road, Wellingborough.*
1889. Jan. ‡Sheldon, W. E., *The Croft, Wantage, Berks.*
1888. Oct. ‡Shore, Ambrose J., 68, *Adys Road, East Dulwich.*
1889. Apr. ‡Short, James Allen, *Sanitary Department, Wigan.*
1891. Nov. ‡Shufflebotham, William, *Roche House, Weston Street, Leek.*
1889. Apr. ‡Sidwell, Henry Thomas, *Elm Cottage, Herne Bay, Kent.*
1891. July. ‡Simmons, Edward John, 80, *Paulet Road, Camberwell.*
1888. Oct. ‡Simmons, Nimrod, *Glendale, Clifton, Bristol.*
1890. Jan. ‡Simpson, John Thomas, 28, *King's Road, Peckham.*
1890. May. ‡Simpson, John, 30, *Belmont Street, Aberdeen.*
1891. Nov. Sinclair, Professor William A., M.D., A.M., *Howard University, Washington D.C., U.S.A.*
1891. Feb. ‡Small, Walter Herbert, *Station Road, St Dunstans, Canterbury.*
1888. Oct. ‡Smith, George Allen, *Vestry Hall, Hampstead.*
1890. June. ‡Smith, Joseph Sidney, 73, *Elm Park, Brixton Hill, S.W.*
1890. Nov. Smith, Sydney, *Dorset Cottage, Hastings Road, Bexhill.*

1891. June. ‡Smith, Warren B., 66, *College Street, Chelsea.*
1890. June. ‡Smith, W. H., 60, *Alma Vale Road, Clifton, Bristol.*
1888. Oct. ‡Soper, Henry Charles, 108, *Park Street, Camden Town, N.W.*
1888. Oct. ‡Sortwell, W., 14, *Retreat Place, Paragon Road, Hackney, E.*
1888. Oct. Southport, The Mayor and Corporation of.
1891. Feb. ‡Spencer, Julius, 6, *Lord Street, Keighley.*
1888. Oct. ‡Stanley, A. W., *Newington, Hull.*
1888. Oct. ‡Steers, George, 21, *Brereton Road, Bedford.*
1888. Oct. ‡Stevenson, John, *Surveyor's Office, East Molesey, Surrey.*
1891. Feb. ‡Stollery, William, *Dust Depôt, Culvert Road, Battersea.*
1890. Apr. Stratford, George Wilkin, 126, *Vauxhall Street, Upper Kennington Lane.*
1889. Apr. ‡Strutt, Thomas Frederick, 5, *Tavistock Street, Covent Garden, W.C.*
1890. Feb. ‡Sutherland, Walter, 8, *Voelas Street, Liverpool.*
1890. Nov. ‡Suttle, Alfred, *Manor Square, Otley.*
1891. Dec. ‡Switzer, Sidney A., 9, *Derby Street, Gray's Inn Road, W.C.*
1890. Nov. ‡Sydenham, Sydney, 37, *Broad Street, Bath.*
1889. Jan. ‡Tait, James, *Roslyn Place, Dean Street, Kilmarnock.*
1889. Jan. ‡Tate, William, 29, *Kenilworth Road, Kilburn.*
1891. June. ‡Taylor, Albert, *Vestry Hall, Mount Street, W.*
1891. Nov. ‡Taylor, Harry William, *Ibstock, Ashby-de-la-Zouch.*
1890. Nov. ‡Taylor, Henry Thomas, 10, *Higham Street, Everton, Liverpool.*
1889. Jan. ‡Taylor, James, 17, *Oxford Street, Hereford.*
1890. May. ‡Taylor, James, 10, *Mount Pleasant, Waterloo, Liverpool.*
1889. Jan. ‡Temple, William Herbert, *Scarborough.*
1890. May. ‡Thomas, George.
1888. Oct. ‡Thomas, Thomas, 4, *Chandos Road, Redland, Bristol.*
1891. Feb. ‡Thomas, Thomas F., 32, *West Square, St. George's Road, Lambeth.*
1888. Oct. ‡Thomas, W. K., 16, *Berkeley Place, Clifton, Bristol.*
1890. Oct. Thompson, Bernard H., *Royal Engineers' Office, Windsor.*
1891. July. ‡Thompson, Ralph, 29, *Hall Hill Bank, Hexham.*
1890. Nov. ‡Thornley, William Frederick, 5, *Napier Villas, Napier Road, Southsea.*
1889. Feb. ‡Thorpe, James, *Hobson House, Tytherington, Macclesfield.*
1890. June. ‡Tomkins, Alfred, 62, *Church Street, Camberwell.*
1891. Nov. ‡Tomkys, F. L., *Yeovil, Somerset.*
1890. Nov. ‡Trigg, Henry John, *Martock, Somerset.*
1891. July. ‡Trowsdale, Tom James, 12, *Leybourne Terrace, Stockton-on-Tees.*
1888. Oct. Tuckey, George F., 47, *Milk Street, Bristol.*
1890. June. ‡Turner, Alfred, 33, *Wordsworth Road, Penge.*
1891. Mar. ‡Twaits, James, 21, *Latham Street, Poplar, E.*

1890. Dec. VEASEY, Thomas Frederick, ASSOC.M.INST.C.E., *care of O. H. Veasey, Bridge House, Huntingdon.*
1891. June. ‡VINCENT, George Edwards Bussell, 55, *Mayfield Road, Dalston.*
1891. Mar. ‡WADDINGTON, Thos. W., 8, *Albert Street, Padiham.*
1890. June. ‡WALKER, Francis, 23, *Woodstock Road, Shepherd's Bush, W.*
1888. Oct. WALLACE, Miss J., 6, *Hyde Park Gardens.*
1889. Nov. WALLAS, Irwin Clarke, 37, *Torbay Road, Willesden Lane, N.W.*
1890. Nov. WALLIS, Thomas Wilkinson, *Surveyor, Louth, Lincoln.*
1890. May. ‡WANSBROUGH, Cecil Shartman, *Arlington Villa, Barrow-in-Furness.*
1888. Nov. WATTS, George Nelson, 147, *High St., Notting Hill, W.*
1890. Jan. ‡WATTS, Gerald, *Local Board of Health, St. George's, near Bristol.*
1890. Feb. ‡WATTS, William Frederick, *Bitterne, Southampton.*
1888. Oct. ‡WEBB, James A., *Town Hall, Fulham.*
1890. Nov. ‡WEEKS, Alfred James, 140, *Lavender Hill, Clapham Common.*
1888. Oct. ‡WELLS, G. F., 37, *Prospect Street, Hull.*
1890. Dec. WHEELER, John, M.D., 35, *Oxford Road, Kilburn, N.W.*
1891. Feb. ‡WHITE, William Owen, 8, *Albert Street, Banbury.*
1891. June. ‡WHITTOME, Philip Alfred, *The Chestnuts, Rothesay Road, Bedford.*
1888. Oct. ‡WILKINSON, W., *Ford Street, Derby.*
1890. Nov. ‡WILLBOND, George Baines, *Guildhall, Nottingham.*
1891. Mar. WILLIAMS, Llewellyn A., 80, *Easton Street, High Wycombe.*
1889. Mar. ‡WILSON, Charles Turle, 37, *Burney Street, Greenwich, S.E.*
1889. June. ‡WILSON, John, *Town Hall, Kensington.*
1889. July. ‡WILSON, William, *Grasington Terrace, South Shields.*
1891. Feb. ‡WINDLE, Thomas, 8, *Tennis Street, Burnley.*
1888. Oct. ‡WINSER, F. Sawyer, 52, *Buckingham Palace Road, S.W.*
1889. Apr. ‡WINTER, Edward, 19, *King's Gardens, W. Brighton.*
1891. July. ‡WOOD, Charles Bruce, 37, *Irene Road, Parsons Green, S.W.*
1889. Jan. ‡WOOD, Peter, 177, *Ashmore Road, Paddington.*
1889. July. WOODCOCK, Henry, 16, *Steelhouse Lane, Birmingham.*
1891. Nov. ‡WOODESON, William, 1a, *Charles Street, Pendleton, Manchester.*
1891. Mar. ‡WOODHOUSE, Tom, 25, *Worsley Road, Leytonstone, E.*
1889. Mar. ‡WOONTON, James, 64, *Anthony Street, E.*
1891. July. ‡WORRALL, Ernest, 64, *Rappart Road, Seacombe.*
1891. Nov. ‡WORRALL, William Henry, 208, *High Street, Harborne.*
1890. May. ‡WRACK, Thomas Philip, 15, *Great Alie Street, Whitechapel.*
1889. Jan. ‡WRIGHT, John, Junr., 3, *Surbiton Park Terrace, Kingston-on-Thames.*

APPENDIX.

THE SANITARY INSTITUTE.

FOUNDED 1876. INCORPORATED 1888.

DESCRIPTIVE CATALOGUE

OF

THE PARKES MUSEUM.

MAINTAINED BY

THE SANITARY INSTITUTE.

Offices of the Institute:
74A. MARGARET STREET, LONDON, W.

August 1891

PREFACE.

THE PARKES MUSEUM was founded at a meeting presided over by Sir William Jenner, Bart., M.D., F.R S., on June 18th, 1876, in memory of the late Edmund Alexander Parkes, who was the first Professor of Hygiene in this country. He was appointed to the Army Medical School, established in 1860, by the late Lord Herbert of Lea.

Her Majesty the Queen and other members of the Royal Family were among the first subscribers to the funds of the new Institution.

In 1877 the Council of University College placed commodious galleries at the disposal of the Committee of the Museum. These galleries were soon filled with objects illustrating various branches of the Science of Hygiene, and, on June 28th, 1879, the Museum was formally opened to the public by the Right Hon. Sir R. A. Cross, G.C.B., Secretary of State for the Home Department.

In 1880 a public meeting was held at the Mansion House, under the presidency of the Lord Mayor, in support of the Museum. This meeting led to a considerable increase in the number of subscribers, and several of the City Companies contributed to the funds of the Museum. A second meeting was held in 1885.

In 1881, on the occasion of the meeting of the International Medical Congress in London, the Committee of the Museum organised the International Medical and Sanitary Exhibition, which was held at South Kensington, in the buildings of the Commissioners of 1851. This Exhibition was the first of its kind in London, and was the precursor of the great Health Exhibition of 1884.

In 1882 the Museum was incorporated, and His Royal Highness the late Duke of Albany became its first President. As, however, the Council of University College now required, for other purposes, the Galleries they

had lent to the Museum Committee, it became necessary to make new arrangements for housing the collection, which had, by this time, considerably increased. The Museum was accordingly removed to the new premises in Margaret Street. About £1,500 were expended in adapting the premises to the requirements of the Museum, the drainage and other arrangements of the building being especially designed and constructed so as to be available for teaching purposes.

In 1883, on the 26th of May, the President, His Royal Highness the Duke of Albany, opened the Museum in its new premises and delivered an address, of which the following were the concluding words: "Our endeavour will be to make the Parkes Museum in every way worthy of the man whose name it bears. To do this, we look for the ungrudging and cordial support of all who are interested in sanitary progress. If such support be accorded us we may fairly hope that the Museum will help materially in the dissemination of that branch of knowledge which, in the words of Dr. Parkes, aims at rendering growth more perfect, decay less rapid, life more vigorous, and death more remote."

The first year during which the Museum occupied its new premises was mournfully marked by the death of its President, an event which was a serious blow to the progress of the Institution, for His Royal Highness had the interests of the Museum deeply at heart, and spared no effort to render it worthy of the objects for which it was established.

A large number of Practical Demonstrations and Lectures have been given from time to time in the Museum.

In 1886 courses of training Lectures suitable for Students preparing for the Examinations of the Sanitary Institute were established and carried on with great success.

On August, 1888, the Parkes Museum was amalgamated with the Sanitary Institute of Great Britain and incorporated under the title of The Sanitary Institute, the Memorandum of Association providing for "The maintenance in London, or elsewhere in the United Kingdom, of a Museum of Hygiene to be called the Parkes Museum, to aid in the Scientific investigation and practical study of all matters relating to health and the laws thereof, and subject to sub-section (E), as a permanent memorial of the late Edmund Alexander Parkes, M.D., F.R.C.P., F.R.S."

The Museum has considerably developed, and a handsome donation from Mr. Rogers Field, M.INST.C.E., has enabled the Council to produce this catalogue and to make considerable re-arrangement of and addition

to the exhibits. A sketch plan of the Museum is given in the catalogue shewing the position of the various classes of exhibits.

The Museum is open free to the public from 10 a.m. to 6 p.m., and on Mondays from 10 a.m. to 8 p.m.

The whole purpose of the Museum is to serve as a means of practical demonstration and teaching for Sanitary Science, and is not designed as an attractive Exhibition. Many of the exhibits are introduced to illustrate defects in material or construction, others are selected to illustrate rather the class they represent than any special merits of any one particular make, but for the guidance of those seeking such information a pamphlet is published containing a list of appliances which have been approved by the Judges, and premiated at the Exhibitions held under the auspices of the Sanitary Institute.

The size and scope of the present building is far below what is felt to be desirable, and even necessary, for the complete demonstration of practical Hygiene, but as the Museum is not in any way subsidised by the State, and is supported entirely by the donations and subscriptions of private members, the Council are much encouraged by the progress already made, and hope that in the future it may grow into a still more useful and representative Institution.

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CLASSIFICATION.

DIVISION A.

Science in Relation to Hygiene.

Anthropology.
Bacteriology.
Chemistry.
Demography.
Geology.
Medicine (Preventive).
Meteorology.
Microscopy.
Physics.
Physiology.

DIVISION B.

Hygiene of Special Classes, Trades and Professions.

Schools.
Various Trades and Manufactures
Hospitals.
Prisons.
Barracks and Camps
Ships.
Workhouses and Asylums.
Artizans' Dwellings.
Municipalities.
Burial of the Dead, Cremation, and other means of disposal.
Prevention of Accidents.
Prevention of Fires.

DIVISION C.

Construction and Sanitary Apparatus.

CLASS I.—Building Materials, Construction and Machinery.

Materials and Construction.
Damp-proof Courses.
Paints and other Protectives.
Wall Papers and Coverings.
Flooring.
Decorative Materials.
Machinery & Mechanical Appliances
Laundry Appliances.

CLASS II.—Water Supply and Sewerage.

Apparatus for Water Supply.
Filtering and Softening Water.
Water Waste Preventers.
Flushing and Watering.
Sinks.
Baths and Lavatories.
Water Closets.
Urinals.
Sewers, Drain Pipes and accessories.
Traps and Gulleys.
Dry Closets.
Sewage Treatment.
Miscellaneous Sanitary Goods.

CLASS III.—Heating, Lighting and Ventilating.

Heating Apparatus.
Cooking Apparatus.
Smoke-preventing Appliances.
Lighting, including Electric Lighting.
Ventilating Gas Burners.
Ventilators.

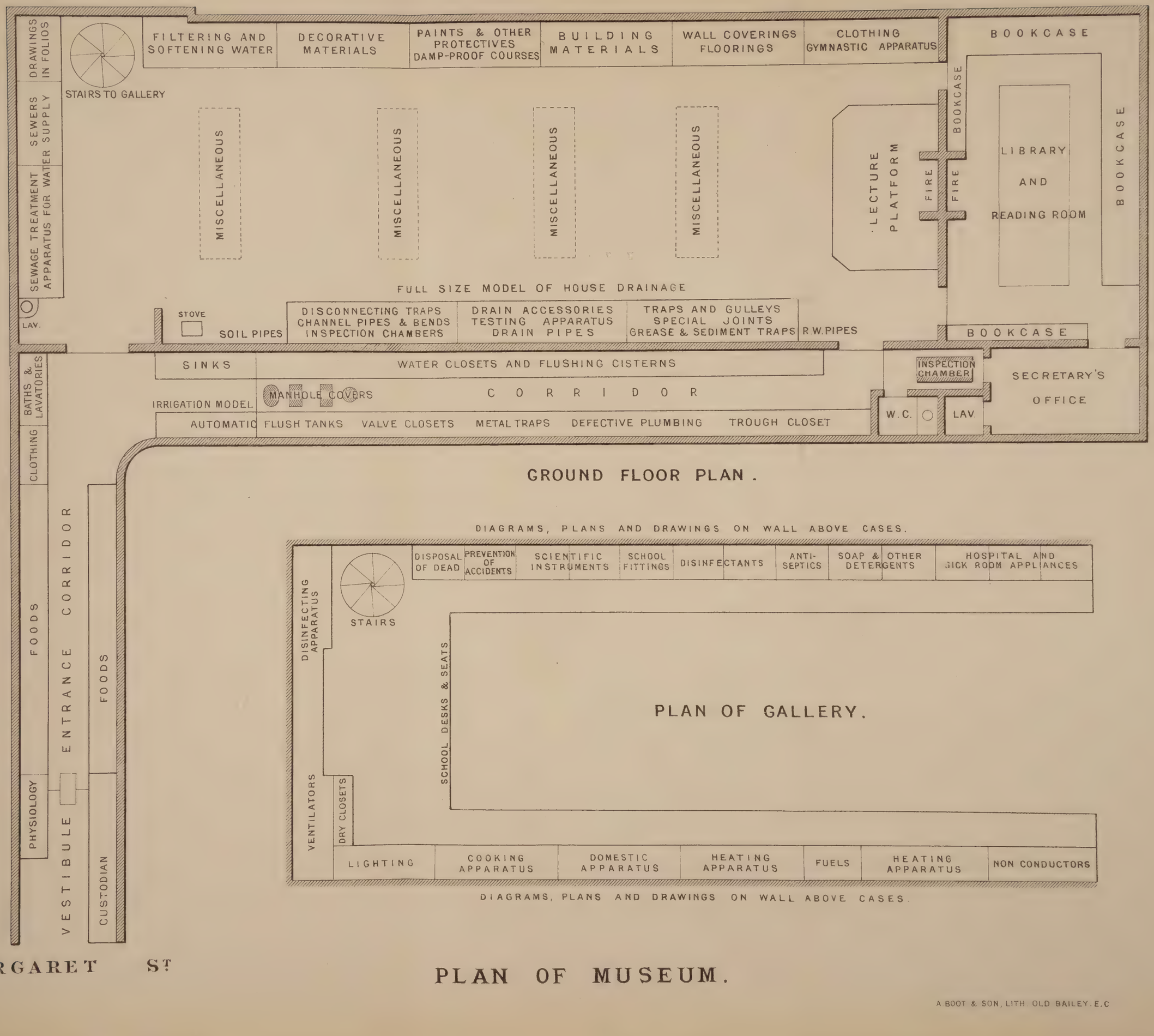
DIVISION D.

Personal and Domestic Hygiene.

Clothing.
Beds and other Furniture.
Hospital and Sick Room Appliances.
Domestic Appliances.
School Fittings.
Gymnastic Apparatus.
Foods.
Domestic Filters.
Mineral Waters.
Soaps and other Detergents.
Antiseptics and Disinfectants.
Disinfecting Apparatus.

NOTE.

The Exhibits placed in the Museum are selected for their utility for the purpose of demonstrating and teaching Sanitary Science, and it does not necessarily follow that all the arrangements and appliances are good, some bad forms being exhibited to illustrate certain principles.



PLAN OF MUSEUM.

A BOOT & SON, LITH OLD BAILEY. E.C

CATALOGUE.

DIVISION A.

SCIENCE IN RELATION TO HYGIENE.

THIS DIVISION INCLUDES THE FOLLOWING :

Anthropology.	Medicine (Preventive).
Bacteriology.	Meteorology.
Chemistry.	Microscopy.
Demography.	Physics.
Geology.	Physiology.

1 **Gas Gauge** (Sugg's), for indicating the pressure of gas.

2 **Thermometer,** in metal case, indicating up to 220° Far.

3 **Floating Thermometer,** used for indicating low temperatures of liquids, such as milk.

4 **Spirit Level**, ordinary

5 **Pressure Gauges,** used for testing purposes.

6 **Gradient Indicator, Adjustable** (Moss Flower's), for laying drains sewers, &c., at any required fall, used in conjunction with a long straight edge. *T. J. Moss Flower.*

7 **Creamometer,** for indicating the percentage of cream raised from milk. *Thos. Bradford and Co.*

8 **Lactometer,** for testing the specific gravity of milk. *Thos. Bradford and Co.*

9 **Pyrometer** (Bailey's), for indicating temperatures of air, used for testing gas stoves, disinfecting apparatus, &c.

10 **Pyrometer** (Cassella's), for indicating temperatures of air, used for testing gas stoves, &c.

11 **Measure, Imperial Quart,** used for testing purposes.

12 **Stop Watch,** used for testing purposes.

13 **Gas Meter**, specially designed for testing purposes, indicating the smallest quantity of gas used.

14 **Equipment for Ordinary Meteorological Station.**

A. Copper Rain Gauge, "Snowdon pattern," 5-inches in diameter, with a deep funnel for the collection of snow. This is usually placed with rim of the funnel one foot above the surface of the ground, preferably on grass.

NOTE.—The names of the donors are placed in italics after the description of each Exhibit.

B. Measuring Glass, into which the contents of the gauge are poured. The highest graduation marked 50 on the glass representing .50 or ½ an inch of rain over the surface of the funnel.

C. Stevenson's Thermometer Screen, for protecting thermometers from direct or reflected rays of the sun, and from wind. This should be placed on legs so that the thermometers are four feet above the ground, and with the door of the screen facing north.

D. Seif-Registering Maximum Thermometer. A small quantity of air is introduced in the column of mercury, which separates about two inches of the column This separated portion is pushed up when the temperature rises and remains at its highest point until shaken down by hand.

E. Self-Registering Minimum Thermometer. A small black index is placed in the column of spirit, which is drawn down as the temperature decreases, but with an increase of temperature the spirit passes and leaves it in position.

F. Dry and Wet Bulb Hygrometer, for ascertaining the humidity of the air; one bulb is exposed directly to the air, the other is covered with a piece of muslin, which is kept damp by a small lamp wick. The evaporation from the muslin cools the thermometer more or less according to the rapidity of the evaporation, and the rate of the evaporation depends upon the humidity of the air, so the difference of temperature between the two thermometers shows the humidity of the air. *L. Casella.*

15 **Sanitary Institute Bronze Medal.** The highest award given by the Institute for articles adjudged to be of special merit by the appointed judges at any of the Institute's Exhibitions.

16 **Sanitary Institute Exhibition Certificate** (framed), showing the form of certificate awarded by the Sanitary Institute for articles of merit exhibited at any of the Institute's Exhibitions.

17 **Sanitary Institute Certificate** for Domestic Hygiene. Lectures for Ladies.

18 **Sanitary Institute Examination Certificate** (framed), showing the form of certificate presented to candidates, who, on examination by the appointed examiners, satisfy them of their competency to undertake the duties of Sanitary Inspectors or Local Surveyors.

19 **Demonstration, Models.** "The Hygiene Cabinet," containing specimens, apparatus and models of sanitary appliances for teaching the general principles and practically demonstrating lectures on Hygiene and Sanitary Science. *Chas. Campbell.*

20 **Demonstration, Model.** Designed by W. H. Knight. A working model in glass representing two closets, soil pipe, house drain, intercepting trap, and drain to sewer. Designed to illustrate several points in reference to ventilation and trap siphonage.

DIVISION B.

HYGIENE OF SPECIAL CLASSES, TRADES AND PROFESSIONS.

THIS DIVISION INCLUDES THE FOLLOWING :—

Schools.
Various Trades and Manufactures.
Hospitals.
Prisons.
Barracks and Camps.
Ships.
Workhouses and Asylums.
Artizan Dwellings.
Municipalities.
Burial of the Dead, Cremation and other means of disposal.
Prevention of Accidents.
Prevention of Fires.

30 **Dwellings for Artizans, Three-roomed** (two plans) showing separate street entrances, yards, and scullery. *M. H. Judge.*

31 **Model Dwellings** (plan and elevation) as erected at Walworth. *Thos. Chatfield Clarke*, F.R.I.B.A.

32 **Hospital, Lying-in, Madras** (plan and elevation). *R. Chisholm*, F.R.I.B.A.

33 **Torquay** (aërial perspective map), with photographs showing principal physical and architectural features, climatic tables, and details of sewerage and water supply.

34 **Drawings** classified in groups, mostly saved from the fire of the Twickenham Museum, as collected and presented by *T. Twining.*

These drawings are collected in the following FOLIOS—

Folio A.—HOMES, ASYLUMS AND HOSPITALS: The Chalmers Hospital, Banff; Hospital Lariboisiere, Paris; Hospital, Bordeaux; Lunatic Asylum, Brentwood; Hotel Dieu, Paris; Military Hospital, Vincennes; Hospital for the Insane, Coton Hill, Stafford; Workhouse, Oxford; Lunatic Asylum, Cumberland; Infirmary, Swansea; Jefferson Medical College Hospital; the Herbert Hospital; Design for small hospital; Royal Victorian Hospital, Netley; City of Glasgow Hospital, Belvidere; Hospital, Ville de Montpellier.

Folio B.—DRINKING FOUNTAINS, BATHS AND WASHHOUSES: Map of Metropolitan district, showing positions where drinking fountains had been fixed up to date; Number of drawings showing elevations of various drinking fountains and cattle-troughs; Plans and details of projected Public Baths and Lavatories for Brussels; Two drawings of Baths and Washhouses erected in the City of Glasgow.

Folio C.—HOUSE TOP UTILISATION: Showing various drawings to illustrate Dr. Dobell's scheme for utilising the roofs of houses as airing-grounds.

Folio D.—ARTIZANS' AND LABOURERS' COTTAGES: The Salopian Societies, Model Cottages; Cottage designs, by Baxendale; Labourers' Cottages, Leeds; Model Dwellings, Pelham Street; Workmen's Dwellings, Saltaire; Three-Roomed Dwellings; Pairs of Cottages; Cottage, Highgate, Photograph; Model Houses for Four and Eight Families, erected by Windsor Royal Society; Scotch Bothy; Triple Cottages; Specifications for Cottage Construction; Design for Cottages in rows; Designs from "Builder"; Thirty diagrams of Cottage Building; Copley Village; Houses adapted to Towns; Lodging House; Model Houses for Four Families; Single and Double Cottages; Noel Park Model Estate.

Folio E.—PEABODY AND OTHER DWELLINGS FOR THE WORKING CLASSES: Columbia Square; Westminster Working Men's Club and Lodgings; Model Dwellings, Fulham; Gatliff Buildings; Peabody Square, Islington; Thanksgiving Buildings, Port-pool Lane; Peabody Buildings, Shoreditch; Peabody Square, Westminster; Peabody Buildings, Commercial Street; Incestre Buildings; Nelson Street Buildings, Bermondsey; Spicer Street Buildings; St. Pancras Buildings; Model Dwellings, Bellorini; Sharpe's Design; The Mall, Kensington; Battersea Park Buildings; King's Cross Buildings; Emperor's Design; Northumberland Buildings, Liverpool; Family Houses, St. Pancras.

Folio F.—MODEL LODGINGS: St. Ann's Court, Soho; Kingston-upon-Hull; Two Specifications; Albert Street Chambers; Glasgow (two drawings).

Folio G.—EDUCATIONAL BUILDINGS: Merchant Venturers' School; Wedgewood Memorial, Burslem; Warehousemen and Clerks' School; Finsbury District Schools; Merchant Taylors' School; The Godolphin Schools, Hammersmith; Hartley Institute, Southampton; Industrial School, Eltham; The Real School, Ofen, Hungary; The Faversham Institute; Public Hall (Soane's Prize); Schools, Walworth; Guards' Institute, Pimlico.

Folio H.—EDUCATIONAL BUILDINGS: Wallraff Museum, Cologne; Hallfield School, Bradford; Field Lane Ragged School; St. Giles' National School; St. Mary's College, Harlow; Schools, Lambeth; Baptist College, Rawden; Orphanage, Broadstairs.

Folio J.—SUBURBAN DWELLINGS: Edinburgh Co-operative Buildings; Metropolitan Association Buildings; Improved Dwellings, Yorkshire; Artizans' Dwellings, Halifax; Labourer's Dwellings, Leeds; Akroydon Houses; Cottages, Sharpe's; Labourer's Dwellings, Leeds; Model Buildings, Pentonville; "Four-family" Cottages; Shaftesbury Park Estate; Mechanics' Houses, Edinburgh.

Folio K.—FOREIGN BUILDINGS: Campo Santo; Baths, Wien; French Model Dwellings; Working Men's Dwellings (Beaucourt); Telegraph Office *French.*

Folio L.—CREMATORIUMS: Siemens, English Pattern; Gorini, design; Lodigiano, design; Polli Clericette, design.

Folio M.—PLANS OF MANHOLES AND SERVICE RESERVOIRS: A series of drawings from designs by Sir Robert Rawlinson; Plans of Baths, W.C., and drainage by H. P. Holt, ASSOC.M.INST.C.E.

Folio N.—HOUSE SANITATION: A series of drawings and plans. *W. P. Buchan.*

Folio O.—HOUSE SANITATION: A series of drawings and plans. *P. F Comber*, C.E.

Folio P.—THAMES EMBANKMENT (Drawings): A complete set of contract drawings, including plans, elevations, sections, and details of the Embankment on both sides of the river, designed by the late Sir J. W. Bazalgette, C.B. *Metropolitan Board of Works.*

Folios Q. R. S.—MAIN DRAINAGE. METROPOLIS. (Drawings): A complete set of contract drawings, including plans, elevations, sections, and details of the following works in connection with the main drainage of the Metropolis, as designed by the late Sir J. W. Bazalgette, C.B., including: South side Low-level Sewer; Southern Out-fall Works, Buildings, and Engines; North side Low-level Sewer; Northern Out-fall Reservoir; Abbey Mills Pumping Station, Buildings, &c.; Western Pumping Station, Buildings, &c. *Metropolitan Board of Works.*

Folio T.—VENTILATION OF WAR SHIPS: A series of drawings of H.M.S. "Agincourt," "Victor Emanuel," "Dreadnought," and Indian Troop Ships, on a large scale, illustrative of the System of Ventilation carried out on these vessels. *The Lord Commissioners of the Admiralty.*

Folio U.—VENTILATION OF PUBLIC BUILDINGS.

Prisons.

35 **Convict Prison** (model) (*near platform*), showing bath rooms, latrines, &c. This building (of which one half only is shewn in model) containing 64 baths, 66 latrines, and four rooms above them was built by convict labour at the cost of £930—the cost if erected by contract is estimated at £1,350.

36 **Pentonville Convict Prison** (model), shewing ventilation air shaft and furnace, furniture fittings, gallery, hand labour mill and means for supervision.

Prevention of Accidents.

50 **Lamps,** for use in mining operations.

51 **Dog Muzzle,** wire netting.

52 **Pole Crab** (Weekes's), for facilitating the release of a fallen horse. *John Weekes.*

53 **Fire Escape** (T. J. Spencer). Two photographs, showing apparatus closed for travelling, and extended for use. *T. J. Spencer.*

54 **Respirator,** with protection for the eyes to enable the wearer to enter a room filled with smoke or noxious gasses.

55 **Reversible Window** (Millar's), for enabling the cleaning of both sashes to be done safely from inside. *Millar's Reversible Window Co.*

Prevention of Fire.

70 **Hand Grenade.** "The Harden Star," for use in the early stages of a fire. *Harden Star Hand Grenade Co.*

71 **Fire Extincteurs.** Two specimens (small and large) charged and placed in accessible positions in Museum. *Haslam Fire Extinguishing Co.*

72 **Concrete Door,** fire-proof. Fixed between Museum and Library *Lascelles and Co.*

Fire-proof Flooring (*see* Nos. 230-1-2).

Fire-resisting Slabs (Hitchen's), (*see* No. 256.)

Slag Felt. Fireproof (*see* No. 149).

Expanded Metal for Plaster (*see* No. 109).

Burial of the Dead, and Cremation.

80 **Crematorium** (model), showing the construction of the first crematorium erected in England in modern times. *J. C. Leach,* M.D.

81 **Crematoriums** (Diagrams in folio **L**), showing designs by Siemens, Gorini Lodigiano, Polli Clericette, and an English system.

82 **Bier.** Diagram and description of model bier. *S. Stretton.*

DIVISION C.

CONSTRUCTION AND SANITARY APPARATUS.

CLASS I.—BUILDING MATERIALS, CONSTRUCTION, AND MACHINERY.

EXHIBITS in this Class are restricted to articles which by their construction or in their composition have some bearing on health.

THE CLASS IS ARRANGED UNDER THE FOLLOWING SUB-HEADS:—

Construction.
Materials.
Damp-proof Courses.
Paints and other Protectives.
Wall Papers and Coverings.
Floorings.
Decorative Materials.
Machinery and Mechanical Appliances.
Laundry Appliances.

Construction.

100 **Window and Door Construction** (full sized model), used as an exhibition case in corridor, showing patent sash fastener and opener, accessible sash weights, door fastening and ventilation, and adjustable shelf support for bookcases. *Messrs. Tonks and Son.*

101 **Window Construction** (model). Showing arrangement adopted at St. George's Hospital for Scullery. *The Committee of Management of St. George's Hospital.*

102 **Window Construction** (model). Illustrating the arrangement carried out at the Middlesex Hospital. *The Committee of Management of the Middlesex Hospital.*

103 **Window Construction** (model). Showing the method adopted at St. Thomas' Hospital. *The Committee of Management of St. Thomas' Hospital.*

104 **Window Construction** (model). Illustrating the arrangement carried out at Guy's Hospital. *The Committee of Management of Guy's Hospital.*

105 **Window Construction** (model). Window and cupboard beneath, as fixed in the Grocers' Company's wing of the London Hospital. *The Committee of Management of the London Hospital.*

106 **Window Construction** (model), with double panes of glass to prevent the conduction of sound, and to maintain an even temperature.

107 **Window Construction** (model). *Wadmore and Baker.*

108 **Hollow Wall Construction** (two specimens) designed to prevent dampness. *G. E. Prichett*, F.S.A.

109 **Expanded Metal** (models and specimens), showing methods of fixing the metal, with plaster applied. *British Metal Expansion Company, Limited.*

111 **Door, Spring** (model).

112 **Door with Equilibrium Action** (model).

113 **Door Lock** (model). An enlarged section showing simple push and pull action. *Josh. Kaye and Sons, Limited.*

114 **Lock,** "push and pull." Fixed on Library door. *J. Kaye and Son.*

115 **Coal Plate,** with self-locking fastening. *Hayward Bros. and Eckstein.*

116 **Ventilating Lid, Duplex** (model) for Water Closets and Sinks. When shut down the space below the lid is opened to the ventilating flue that runs up the wall to the top of the building, but when the lid is raised it closes the opening to this flue. *H. Saxon Snell,* F.R.I.B.A.

117 **Ash Pan, Improved Tipping** (model). The contents of pan can be periodically collected from outside, thus obviating the necessity of the dustman entering the premises where the yard is bounded by a public road. *Holme & Arveschough's Patent.*

Brick Wall Construction (*see* No. 180).

House Drainage. Full size model, showing soil pipe, drain, and intercepting chamber construction (*see* No. 490).

Drainage of Museum, with plans of same (*see* Nos. 491-3).

(b) Materials.

130 **Glazed Bricks,** several specimens of glazed bricks in various colours and two specimens of dados built up. *Cliff and Sons.*

131 **String Courses** (several specimens). *Stiff and Sons.*

132 **Terra Cotta** (two balusters), red. *Stiff and Sons.*

133 **Terra Cotta Cornice,** fixed. *Doulton and Co.*

134 **Concrete** (two balusters), red and green. *Lascelles and Co.*

135 **Stoneware** (two keystones) made in salt glazed stoneware. *Stiff and Sons.*

136 **Fire Clay** (glazed), several specimens of glazed fire clay, kerbs, mouldings, and cornices. *Doulton and Co.*

137 **Bracket and Cornice** in Glazed Terra Cotta. *Cliff and Sons.*

138 **Iron Wall Ties,** for bonding hollow walls (six specimens). *Chambers and Co.*

139 **Sand, Lime and Cement** (in glass case). Various specimens used in the preparation of concrete, mortar, cement and plaster, including sand, ballast, coke breeze, gravel, Portland cement, limes, mortar, concrete, hair, Parian cement, plaster of Paris. *Broad and Co.*

140 **Building Bricks** (specimens of), Pressed Brick unglazed, ditto glazed, Red Facing, Red Pavior, Red Berkshire Kiln-burnt, Red Rubber Berkshire ditto, Blue Pressed Staffordshire, Fire Brick Stourbridge, White Facing Suffolk, Malm Facing Bucks (clamp burnt), Picked Cowley Stock (clamp burnt), Gault Pavior, Brimstone Pavior (Suffolk-kiln), Building Pavior (clamp burnt), Rock Huff Facing Flintshire, Washed Stock, Grey ditto, Rough ditto, Place, Grizzles. *Broad and Co.*

141 **Stoneware Bricks.** *Stiff and Sons.*

142 **Glazed Stoneware Bricks.** *Candy and Co.*

143 **Terra Cotta Bricks.** *Candy and Co.*

144 **Hollow Wall Tie Bricks.** *Geo. Jennings.*

145 **Paving Bricks,** Blue Stable Pavior 8 panels, ditto 2 panels, ditto diamonds, Adamantine clinker, Lincolnshire. *Broad and Co.*

146 **Silicon Treads** (two specimens) round and square nosing. *Doulton and Co.*

147 **Air Bricks** (several specimens) in various materials, and in a variety of sizes, including stoneware, terra cotta and fire clay.

148 **Marbles** (four specimens) of Irish marbles (in frame in front of platform). *R. Colles.*

149 **Non-Conducting Slag Felt** (in glass case on table in centre of hall) for insulating fire and sound proofing, and for proof against vermin *C. Baatsch.*

150 **Japanese Appliances and Materials,** including specimens of bricks, roofing tiles, channel pipes, shingle for roofing purposes, soaps, paper and several models of walls for interior and exterior. Models of folding screens, water pipes, brushes, urinary tub and domestic utensils. *The International Health Exhibition Committee.*

151 **Hearth Tiles.** Specimens of tiles laid for hearths. *Webb and Co.*

152 **Hearth Tiles and Fender Kerbs.** Fixed in fire place on platform. *Doulton and Co.*

Damp-Proof Courses.

170 **Concrete Slab and Cappings.** *The Eureka Concrete Company.*

171 **Damp-proof Course,** glazed stoneware. *Doulton and Co.*

172 **Damp-proof Course,** glazed stoneware. *Stiff and Sons.*

173 **Impervine Slab** for damp-proof course. *J. C. Bloomfield.*

174 **Concrete Slab** with polished Mosaic surface. *C. Drake and Co., Ltd.*

175 **Asphalte Roof** (model) laid $\frac{3}{4}$in thick in two layers of $\frac{3}{8}$ inch each, with flashing to brick-work and angle fillets. *Val de Travers Asphalte Paving Company, Limited.*

176 **Asphalte Floor** for basement (model), including damp course in wall, and vertical covering to outside face of same, to withstand pressure of water in wet situations. *Val de Travers Asphalte Paving Company, Limited.*

177 **Roofing Slates** often used as a damp-proof course.

178 **Willesden Paper** for under-lining damp walls. *Willesden Paper Co.*

179 **Hygeian Rock Composition** (model) showing method of application and illustrating the damp-resisting qualities. *W. White.*

180 **Damp Proof Courses.** Four models, built with bricks (one-eighth ordinary size), upon an artificially damped foundation.

A. represents a 9-inch wall with quoin (English Bond), mortar joints, and a damp proof course, consisting of two rows of slate bedded with cement.

B. represents a 9-inch wall (Flemish Bond) with mortar joints. There is no damp proof course in this model, and, consequently, the effects of damp can be traced through the whole of the brickwork.

C. represents a 9-inch wall with glazed stoneware damp proof course.

D. represents a 13½-inch wall with air space, built to illustrate the requirements of the Model Bye Laws, where rooms are built for occupation below the ground level. The damp proof course in this model consists of asphalte laid above the ground line in outer portion of wall and below the floor line in inner portion.

Paints and other Protectives.

190 **Barff Process.** Specimen of iron treated by the Barff process, a process in which the iron is subjected to super-heated steam and coated with black magnetic oxide, which is indestructible by atmospheric influences.

191 **Galvanized Iron.** Specimen of iron coated with zinc, by the process known as galvanizing.

192 **Angus Smith's Solution.** Specimen of iron treated with this solution. The solution is a coal tar preparation, and applied whilst the iron is at a high temperature.

193 **Burnettized Wood.** Specimens treated by this process to preserve it from the effects of dampness and atmospheric changes. *Sir Wm. Burnett and Co., Limited.*

194 **Duresco and Charlton White.** The ceiling in central hall of Museum is decorated with these materials. *J. B. Orr and Co.*

195 **Non-Arsenical Colours** (in glass case). Specimens of colours used by Messrs. Woollams and Co. in decorating their wall papers, and suitable for decorative purposes in distemper. *William Woollams and Co.*

196 **Antioxide.** Piece of iron, one side originally polished, half of which was painted with antioxide and then exposed to sulphuric acid gas. *Peters, Bartsch and Co.*

197 **Carbolineum,** Two pieces of wood prepared with carbolineum and placed in the ground for three years ; also piece of wood not treated and put in the ground at the same time ; about 12 inches of a stake removed from the ground after 15 years' exposure ; one paring block, immersed for ten minutes, showing penetration ; and other specimens. *Peters, Bartsch and Co.*

Wall Papers and Coverings.

210 **Wall Paper** (twelve specimens) framed and hung on south wall of Museum, showing designs and qualities of Woollam's non-arsenical wall papers. *Wm. Woollams and Co.*

211 **Wall Paper** (dados, fillings, and friezes), affixed to wall at the end of Museum behind the platform, illustrating pattern and general effect of Woollam's non-arsenical wall papers. *Wm. Woollams and Co.*

212 **Wall Paper** (Pattern Book) of specimens of washable papers. *Jeffrey and Co.*

213 **Wall Paper**—non-arsenical (specimens). *Jabez Hogg*, F.R.C.S.

214 **Wall Paper, Washable** (patterns). Designed to be washable, waterproof and non-poisonous. *Fisher and Co.*

215 **Japanese Leather Hangings** (several specimens). A washable and decorative material. *Maguire and Son.*

216 **"Willesden" Paper** (specimens in frames), for underlining damp walls, etc. *Willesden Paper Co.*

217 **Wall Papers,** in frames on wall near staircase. Illustrating speciality of design. *D'Oyly and Co.*

218 **Lincrusta Walton** (specimens fixed on wall) near entrance to Museum. This material is made in neutral tints, and treated decoratively with ordinary paint. *Lincrusta Walton Co.*

219 **Anaglypta** (specimens on wall, ceiling and in panels). The decorative treatment of this material is effected with ordinary paint. *Anaglypta Co.*

Duresco and Charlton White. See Paints and Protectives.

221 **Plaster Slabs** (Hitchen's). Several specimens of ceiling slabs, pilasters and arches. Fire-resisting and decorative. *R. W. Hitchens.*

222 **Wall Tiles,** for exterior. Several specimens in frame near staircase. *Thos. Lawrence and Son.*

223 **Hanging Wall Tiles** (Hall's.) Several specimens, showing colours and method of fixing. *Cliff and Sons.*

224 **Wood Panels.** Several specimens of mouldings and panelling fixed on platform, also two panels in walnut and pine. *J. F. and G. Harris and Co.*

Wall Tiles (several specimens in frames on wall) sent by various makers, including Minton's, Doulton's, Jos. Cliff and Son's, and Burmantoft's. See Decorative Materials.

Flooring.

230 **Fire Proof Flooring** (Doulton Peto), showing skew-block with girder protection, key of arch and key for plaster. *Doulton and Co.*

231 **Fire Proof Flooring** (specimen), showing girder protection and key for plaster. *Homan and Rodgers.*

232 **Hollow Flooring** (specimen), damp and fire-proof, and convenient for ventilation or warming. *G. E. Pritchett*, F.S.A.

233 **Concrete Slabs,** for Flooring. *Eureka Concrete Co.*

234 **Wood Block Flooring,** Immovable Acme (Duffy's). A small specimen, showing method of joining; and also a portion of the floor of hall (near the entrance) covered with this flooring laid by the patentees in 1885. *Duffy and Co.*

235 **Parquet Flooring.** Specimen.

236 **Paraffined Flooring.** Specimens showing details of construction, and a portion laid in floor of hall. This flooring is specially prepared with paraffin and fixed without showing nail holes. As laid in the Bristol General Hospital under the supervision of the late W. Eassie, C.E. *Thos. Jennings.*

237 **Paraffined Flooring.** Specimen of flooring taken from a bay window after ten years' exposure. *Chas. Langstaff*, M.D.

238 **Paraffined Flooring** (Model of Floor) laid diagonally with bevel edged boards and treated with paraffin. *Chas. Langstaff*, M.D.

239 **Parquet Flooring** (specimen in teak) as laid in Westminster Hospital. *Howard and Sons.*

240 **Wood Blocks for Flooring,** showing staining penetrated through the whole thickness of the wood; designed to maintain the pattern as the surface becomes worn down by traffic. *Webb's Worcester Tileries Co.*

241 **Wood Block Flooring** (Disc Key). Specimens laid in floor of hall. *Westminster Patent Flooring Co.*

242 **Parquet Flooring.** Specimen laid on Library floor. *Howard and Sons.*

243 **Mosaic Flooring.** Specimen laid in Library hearth. *Diespeker and Co.*

244 **Mosaic Flooring.** Specimen of marble mosaic, laid in floor of Museum. *Mainzer and Kempthorne.*

245 **Linoleum.** Portions laid on stone floor of corridor and wood floor of gallery. *The Addlestone Linoleum Co.*

246 **Wood Flooring.** Fixed on platform, illustrating various styles. *J. F. and G. Harris and Co.*

Decorative Materials.

250 **Wortley Faience.** Specimen of dados, panels, cornices, friezes, hearth and floor tiles. *Cliff and Sons.*

251 **Tiles.** Specimens of hand-painted tiles and panels and Doulton ware, filters and vases. *Doulton and Co.*

252 **Tiles.** Specimens of hand-painted and embossed tiles for walls, &c. *Minton, Hollens and Co.*

253 **Faience Panel and Wall Tiles.** Three panels on wall of Museum, decoratively treated with "Burmantoft's" glazed tiles and faience panel. *The "Burmantofts" Co., Limited.*

254 **Stoneware Panel.** *Stiff and Sons.*

255 **Red Concrete Panel.** *W. H. Lascelles and Co.*

256 **Pilaster Ceilings and Arches** in Hitchen's patent fire-resisting plaster slabs. Fixed under gallery and at end of hall. *R. W. Hitchens.*

257 **Red Concrete.** Head of Minerva on bracket in Library. *W. H. Lascelles and Co.*

258 **Mosaic.** Head of Moses. (Near platform.)

259 **Vases and Plaques.** Specimens of Faïence and Doulton ware vases and plaques *Doulton and Co.*

CLASS II.—WATER SUPPLY & SEWERAGE.

THE CLASS IS ARRANGED UNDER THE FOLLOWING SUB-HEADS:—

Apparatus for Water Supply.
Filtering & Softening of Water.
Water Waste Preventers.
Flushing and Watering.
Sinks.
Baths and Lavatories.
Water Closets.
Urinals.
Sewers, Drain-pipes and Accessories.
Traps and Gullies.
Dry Closets.
Sewage Treatment.
Miscellaneous Sanitary Goods.

Apparatus for Water Supply.

280 **Wooden Pipes** (two specimens). Pipes used for water mains. *West Middlesex Water Works Co.*

281 **Water Fittings,** including (A) meter, (B) stop valve, (C) lavatory valves, (D) self-closing valves, (E) regulating stop valve, (F) bib valves, (G) reverse ball valve in automatic tank, and (H) pressure gauge. *Tylor and Sons.*

282 **Water Meter** (Ahrbecker's). The water is made to pass through oblique apertures in a fixed plate into oblique or spiral passages in a rotating cylinder, the axle of which turns the index of a dial. *H. C Ahrbecker and Son.*

283 **Hydraulic Ram.** *C. L. Hett.*

284 **Tin-lined Lead Pipes** (in glass case), for water, beer, mineral waters, etc.; designed to prevent lead poisoning. *Messrs. Quirk, Barton and Co.*

285 **Glass-lined Iron Pipe** (two specimens), showing bend and method of jointing. *Cooper and Co.*

286 **Valves** (Trott's). Several specimens of valves, including ball, stop, bib and lavatory valves, illustrating the adaptation of the patent to each form. One of these valves will be found fixed in corridor near entrance to Museum. These valves are provided with an arrangement by which the seating can be removed for repairs without cutting off the water supply. *H. Trott.*

287 **Self-closing Valve** (Jenning's), designed to prevent waste of water by carelessness or neglect. *Geo. Jennings.*

288 **Solderless Jointing for Lead Pipes** (Law's), showing stop-cock and unions. *Hy. Law*, M.INST.C.E.

289 **Stop-Cock.** Quick turn, with grooved joints for fixing to lead without solder, and designed to stand high pressure. *Tylor and Sons.*

290 **Rat-gnawed Pipes.** Several specimens of pipes showing the indented marks of teeth, clearly tracing the damage done by rats. *Rogers Field*, M.INST.C.E.

291 **Corroded Pipes.** Two sections of wrought iron pipes lined with deposit, taken from the Great Northern Hotel. *H. Harland.*

292 **Fountain** (terra-cotta), fixed in corridor. *Doulton and Co.*

293 **Ball, Valve,** with glass float. *G. F. L. Meakins.*

294 **Iron Pipe.** Specimen taken up after being embedded in cement for nine years, showing how the cement had eaten through the enamel in several places and also through the pipe. *Dr. Graham.*

295 **Root,** found growing in an underground drinking water tank at Campden Hill, W. *Ernest Turner,* F.R.I.B.A.

290 **Abyssinian Well Driving Apparatus** (Norton's), showing pioneer tube, driving weight or monkey, tripod and pulleys. *Legrand and Sutcliff.*

297 **Force Pump** for testing purposes. *Tangyes.*

298 **Rain Water Separator** (Roberts'), designed to allow the washings of the roof at the commencement of rain to pass away to drain, and to store only clean potable water. *C. G. Roberts.*

299 **Lead Lined Tank,** (about 250 gallons) with 1-inch ball valve, used for storage of water for Museum.

300 **Indestructible Combination Washers,** for flange joints. *Peters, Bartsch and Co.*

Flushing and Watering.

320 **Automatic Siphon Flush Tank** (Field's) with glass front, showing the construction and action. This tank is fitted to and flushes a two-seat trough closet. *Bowes Scott and Western.*

321 **Automatic Siphon Flush Tank** (Doulton's), used for flushing urinals. *Doulton and Co.*

322 **Automatic Siphon Flush Tank** (Doulton's). About 10 gallons *Doulton & Co.*

323 **Automatic Siphon Flush Tank** (Emanuel's), with glass front and reverse ball-cock action. On the lever being raised the valve is opened, and where a good pressure of water is obtainable the rush of water at the last stage of filling is sufficient to start the Siphon which discharges the contents of tank. *Emanuel & Son.*

324 **Automatic Flush Tank** (Maguire's). Mechanical in action, for flushing house drains, trough closets and urinals. *Maguire and Sons.*

325 **Stoneware Automatic Siphon Flush Tank** (Field's). Fixed in position, showing sink and other wastes entering over grating and discharging to model cottage garden by sub-soil drains. *Rogers Field*, M.INST.C.E.

326 **Flush Tank.** Working model in glass of (Field's). Automatic siphon flush tank. *Rogers Field*, M.INST.C.E.

327 **Flush Pot** (Col. Waring's). For fixing beneath scullery sinks, designed to intercept fat, and facilitate the periodic flushing of scullery drains. *Tylor and Sons*

328 **Flushing Cistern** with glass front, and ordinary spindle valve connected to lever with wire.

329 **Flushing Cistern,** siphon. *The Falcon Brass Works Co.*

330 **Flushing Cistern,** siphon. *Winser and Co.*

331 **Flushing Cistern,** tranquil siphon (Bolding's). Connected to closet and arranged with seat action. *J. Bolding and Sons.*

332 **Flushing Cistern,** siphon, The "Tower" (Tylor's). *Tylor and Sons.*

333 **Flushing Cistern,** siphon (Jenning's). Connected to closet and arranged with seat action. *Geo. Jennings.*

334 **Flushing Cistern,** siphon (Braithwaite's). The siphon is made to discharge the contents over the side instead of through the bottom, as in most other cisterns. *H. Braithwaite and Co.*

335 **Flushing Cistern,** the "Vacuum" (Doulton's). *Doulton and Co.*

336 **Flushing Cistern,** siphon, "The Peckham" (Syer's). This flushing cistern is started into action by pneumatic push instead of the ordinary chain pull and lever. *M. Syer.*

337 **Flushing Cistern,** Silent, siphon (Bostel's). Fitted with glass front to show the action. *D. T. Bostel.*

338 **Flushing Cistern,** siphon, the "Newman" (Scott Moncrieff's) *North British Plumbing Co.*

339 **Flushing Cistern,** fixed in W.C. (Bean's).

Sinks.

350 **Cecil Slop Sink** (Cliffs'), with flushing rim, for hospitals, housemaids' closets, &c. *Cliff and Son.*

351 **Housemaid's Sink,** enamelled slate, square earthenware basin with flushing rim, water supply and brass rest for pails. *George Jennings.*

352 **Scullery Sink.** Glazed earthenware, fitted to model wall, with cold water supply and trapped waste. *Smith and Co.*

353 **Lead Lined Sink,** fitted with cold water supply and Waring's flush pot beneath. *Tylor and Sons.*

354 **Slop Sink.** Porcelain glazed, "The Imperial." *Cliff and Son.*

355 **Butler's Pantry, Sink.** Porcelain glazed. *Cliff and Son.*

356 **Scullery Sink.** Cement. *The Eureka Concrete Company.*

357 **Scullery Sink.** Glazed earthenware. *Stiff and Son.*

Baths and Lavatories.

370 **Fireclay Bath,** glazed inside and outside, with beaded edge, designed to stand without enclosure, fitted with plug waste. *Jos. Cliff and Sons.*

371 **Lavatory Angle,** earthenware top, basin and top combined, with soap trays draining into basin, fitted for cold water with cam action valve, and lift-up waste. *J. Tylor and Sons.*

372 **Lavatory** (section), showing moveable grid to overflow, and overflow connected to trap to enable the cleaning of pipe and trap, also brass trap with inspection cap and vulcanite plug to basin. *Burn and Baillie.*

373 **Lavatory** (fixed in secretary's office), with marble top, porcelain basin with flushing rim, screw-down cold water valve and lift-up waste. *J. Tylor and Sons.*

374 **Bath Waste,** with 4-inch gird, enabiing the bath to be rapidly emptied, and making the discharge a valuable flushing agent for the drains. *Burn and Baillie.*

375 **Lavatory Basin,** with accessible standing waste and overflow. *Tylor and Sons.*

Water Closets.

380 **Long Hopper.** Specimen of old pattern deep hopper water closet (fitted with spindle valve flush cistern).*

381 **"Pan Closet,"** with cast iron container copper pan and spreader. *Prof. W. H. Corfield.*

382 **Short Hopper,** 40a, with S trap (fitted with siphon flushing cistern).* *Sharp and Co.*

383 **"The Dececo."** The special distinction of this closet is in the siphon form of the outlet, which is designed to exhaust the contents of the basin (fitted with special flushing cistern).* *Winser and Co.*

384 **"The Trone"** Pedestal, fitted with seat action. This closet is of the hopper type. The basin and trap is made in one piece of earthenware, and designed to stand without wooden fixtures (fitted with Bolding's Tranquil flushing cistern).* *J. Bolding and Son.*

* For particulars of Flushing Cisterns see FLUSHING AND WATERING.

385 **"The Compound"** Pedestal Hopper, designed to stand without riser (fitted with Tylor's Tower flushing cistern).* *Tylor and Sons.*

386 **"The Pedestal"** Wash-out. This closet is fixed with a self-raising seat and automatic action for flushing, and stands without wooden enclosure (fitted with Jenning's flushing cisterns).* *George Jennings.*

387 **"The Ariston"** Hopper Water Closet and Slop Sink, with earthenware trap and flushing rim, and provided with wooden seat for use as an ordinary water closet (fitted with Braithwaite's siphon flushing cistern).* *Tylor and Sons.*

388 **"The Excelsior,"** Wash-out (fitted with Bostel's Silent flushing cistern).* *D. T. Bostel.*

389 **Plug Valve,** (Jenning's), with basin and trap in one piece, and fitted with Jenning's regulating water supply valve. *George Jennings.*

390 **Pedestal Hopper Closet,** made in fire-clay, and glazed basin and trap in one piece. *Dent and Hellyer.*

391 **Water Closet,** pedestal Hopper, with lead trap. *J. Bolding and Sons.*

392 **"Table Top" Closet**, of the Hopper type, combined water closet and slop sink. *Dent and Hellyer.*

393 **Valve Water Closet,** with water regulating valve, weir overflow on one side, discharging into lead safe. *Tylor and Sons.*

394 **"The Optimus,"** Pedestal Valve, with earthenware valve box, pneumatic water regulator and special flushed and ventilated overflow. This closet is self-contained and requires no wooden fixtures. *Dent and Hellyer.*

395 **"The Simplex" Valve Closet,** with cast lead valve box, pneumatic regulating valve and special water supply to trap of overflow. *J. Bolding and Sons.*

396 **Trough Closet** (fitted with Field's automatic flush tank). By increasing the size of the flush tank these closets may be used in ranges. They are convenient for use in schools, factories, and similar institutions. *Bowes Scott and Western.*

397 **Old cast-iron Hopper Water Closet,** with lip-trap cast in it. Removed from a house in Mayfair Market. It was served by a $\frac{1}{2}$-inch service direct from the main into the left-hand notch at the top of basin; a $1\frac{1}{2}$-inch lead rain-water pipe from roof of closet discharged into the right-hand notch. The basin was fixed over a brick cesspool 8 feet deep. *Prof. W. H. Corfield.*

398 **"The Household,"** Hopper type (in use in W.C. at the end of corridor) fitted with Bean's flushing cistern. The floor and wall of closet are tiled. The closet is fixed without riser, and every part is open to inspection. This closet, fixed in 1883, was probably the first in England arranged in this way.

399 **Connections, India Rubber** (Twyford's), for making joint between the flushing pipe and the arm of closet basin. *T. Twyford.*

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* For particulars of Flushing Cisterns see FLUSHING AND WATERING.

Urinals.

420 **Self Flushing Urinal** (Wright's). This urinal is fixed in W.C. at end of corridor, in working order, and all pipes and siphons are fitted to enable the details to be clearly seen. *A. White and Sons.*

421 **Urinal Basin,** angular, cast-iron. *A. Kenrick and Sons.*

NOTE.—Several water closets, which are designed to combine the convenience of a urinal, may be seen in the corridor, and descriptions of these will be found under Water Closets. Described as Pedestal, Compound, Combination, &c.

Sewers, Drain Pipes, and Accessories.

430 **Egg-shaped Sewer** (model) built up with earthenware sections.

431 **Egg-shaped Drain Pipe.** Glazed earthenware. *Cliff and Sons.*

432 **Stoneware Drain Pipe** (Doulton's), 12-inch, tested. *Doulton and Co.*

433 **Invert Block** for bottom of brick sewer. *Stiff and Sons.*

434 **Enamelled Iron Sewer,** with subsoil drain (model) (Hawkins'). *I. T. Hawkins.*

435 **Junction Block,** stoneware, for connecting 4-inch pipe drain with brick sewer. *Smith and Co.*

436 **Inspection** or **Lamphole Block,** stoneware, for fixing in the top of large brick sewers. *Smith and Co.*

437 **Drain Pipes** (Doulton's), 3, 4 and 9-inch best London, tested, glazed earthenware, drain pipes with ordinary spigot and socket ends. *Doulton and Co.*

438 **Drain Pipe** (Doulton's). Vitrified glazed, 6-inch. *Doulton and Co.*

439 **Drain Pipe with Stanford Improved Joints** (Doulton's), self-adjusting and self-jointing 6-inch pipes. A bituminous composition is moulded to both ends of the pipe, which is designed to form a perfectly water-tight but not a rigid joint. *Doulton and Co.*

440 **Stoneware Drain Pipe** (Jenning's), 6-inch, with butt ends for use with patent sockets. *Geo. Jennings.*

441 **Stoneware Drain Pipe,** 9-inch. *Cliff and Sons.*

442 **Drain Pipes,** with double seal joint (Tyndale's patent), 6-inch. *Cliff and Sons.*

443 **Taper Pipe.** Glazed stoneware for increasing diameter of drain from 4 inches to 6-inches. *Cliff and Sons.*

444 **Drain Pipe Joint** (model) (Stanford's). Self-jointing, with square junction and stoppers. *Doulton and Co.*

445 **Drain Pipe Joint** (models) (Mawbey's). This pipe is made with divided sockets, and has studs in the lower half of the sockets, to ensure a true bore. *T. Wragg and Sons.*

446 **Drain Pipe Joint** (Jennings'). Two halves of socket. A specimen of the pipe which butts into this socket will be found with Drain Pipes No. 440. *George Jennings.*

447 **Drain Pipe Joint** (Archer's), showing cement and clay keyed joint; also holes for pouring in liquid Portland cement. *The Archer Pipe Co.*

448 **Drain Pipe Joints** (Maguire's). Specimen of chair or rest for stoneware pipe joint. For method of fixing, see Model No. 449. *Maguire and Sons.*

449 **Drain Pipe Joints** (model) (Maguire's), showing method of jointing Maguire's patent pipes with stoneware chairs or rests. *Maguire and Sons.*

450 **Rough Bends.** Two specimens, one new from the works and the other as removed from a drain with the way blocked.

460 **Knuckle Bend,** stoneware, 4-inch. *Doulton and Co.*

461 **Knuckle Bend,** stoneware, 4-inch. *Cliff and Sons.*

462 **Bends,** stoneware, 4-inch, easy. Two specimens with differing radius. *Doulton and Co.*

463 **Bends,** stoneware, 4-inch, sharp. Two specimens with differing radius. *Cliff and Sons.*

464 **Bend,** stoneware, 4-inch, sharp, with inspection socket. *Cliff and Sons.*

465 **Junction Pipe,** stoneware (V shape), 4-inch on 4-inch. *Doulton and Co.*

466 **Junction Pipe,** stoneware (V shape, with inspection socket), 4-inch. *Doulton ond Co.*

467 **Junction Pipe,** stoneware (Y shape), 4-inch on 4-inch. *Doulton and Co.*

468 **Junction Pipe,** stoneware (double Y shape), 4-inch on 4-inch. *Doulton and Co.*

469 **Junction Pipe,** stoneware (Y shape), 4-inch on 6-inch. *Cliff and Sons.*

470 **Junction Pipe,** stoneware (double Y shape), 4-inch on 6-inch. *Cliff and Sons.*

471 **Junction Pipe,** stoneware (double Y shape, with inspection), 4-inch on 6-inch. *Cliff and Sons.*

472 **Junction Pipe** (model), iron, with air-tight inspection cover (Scott Moncrieff's). *North British Plumbing Co.*

473 **Set-off Pipe,** stoneware, 4-inch. *Doulton and Co.*

474 **Flap Valve,** 4 inch, used in drains for preventing backflow either from overcharged drains and sewers or from tidal flow. *Smith and Co.*

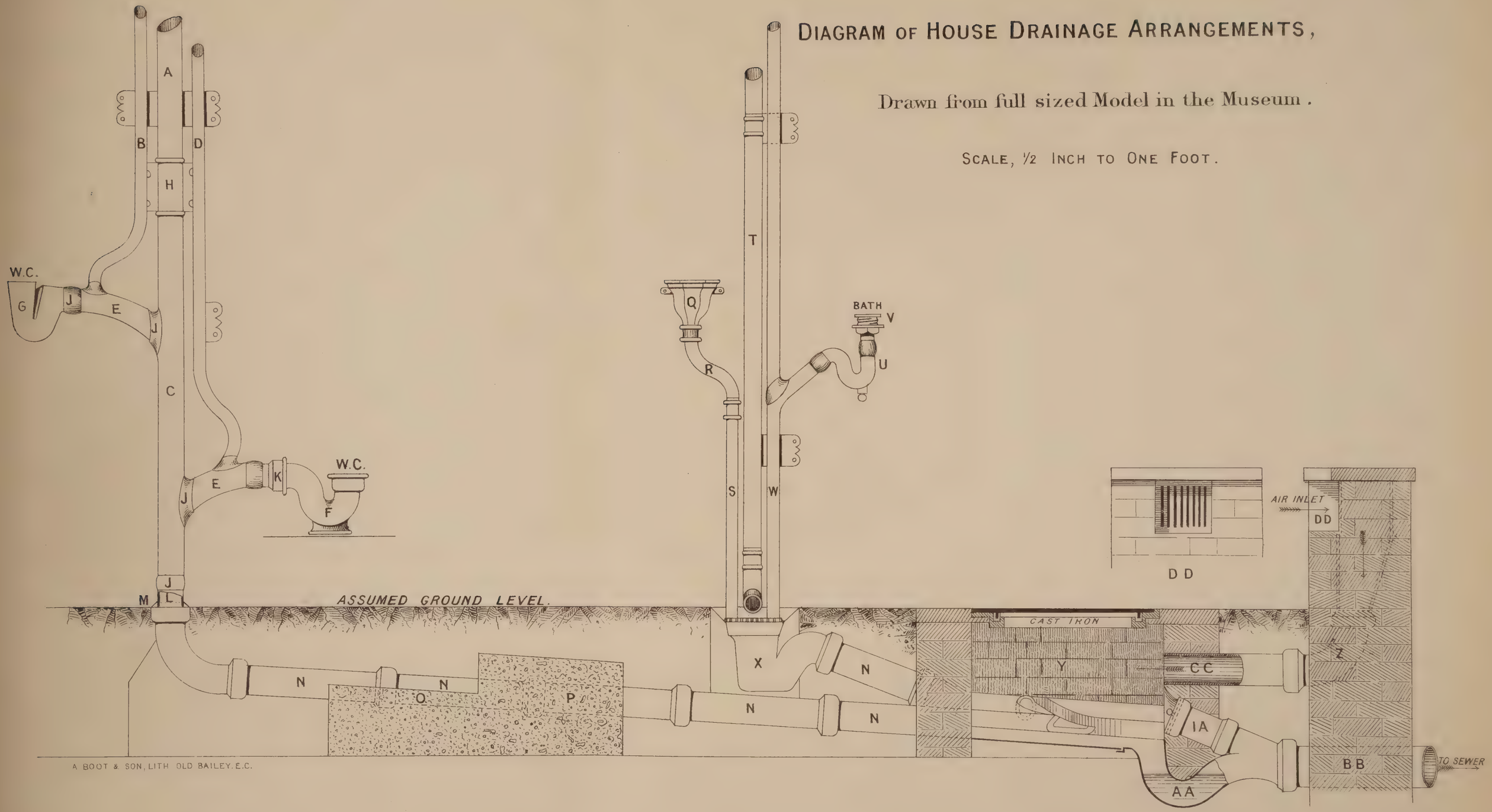
475 **Flap Valve** (Baldwin Latham's design), with balanced weight, 4-inch, used in drains for preventing backflow either from overcharged drains and sewers or from tidal flow. *Doulton and Co.*

476 **Rain Water Shoe** (Hellyer's), to receive the discharge of rain water pipes and surface drainage. This shoe does not act as a trap. *Doulton and Co.*

DIAGRAM OF HOUSE DRAINAGE ARRANGEMENTS,

Drawn from full sized Model in the Museum.

SCALE, ½ INCH TO ONE FOOT.



A BOOT & SON, LITH OLD BAILEY. E.C.

A Ventilating Shaft.
B 2in. Air Pipe (Anti-Siphonage).
C 4in. Drawn Lead Soil Pipe, 10lb. lead.
D 2in. Air Pipe (Anti-Siphonage).
E 4in. Lead Branches for Closets.
F Eartheware Closet Trap.
G Anti D Trap.
H Astragal Joint.

J Wiped Solder Joints.
K Brass Ferrule for jointing Earthenware Trap to Lead.
L Brass or Copper Thimble for connecting Stoneware Bend to Lead Soil Pipe.
M Cement Joint (in Section).
N 4in. Drain Pipes jointed with Cement.
O Two Feet of Pipe bedded on 6in. Concrete.
P Two Feet of Pipe bedded in 6in. Concrete.

Q Hopper Head (Galvanized Iron) for Lavatory Waste.
R 6in. Set-off do. do.
S 3ft. Length do. do.
T 6ft. Length 3in. do. Rain Water Pipe and Shoe
U Lead P Trap with Cleaning Screw.
V Plug Waste for Bath.
W Bath Waste Pipe with Ventilatting Pipe above.

X Trapped Gully.
Y Disconnecting Chamber lined with White Glazed Bricks with Benchings rendered in Cement and with Glazed Channels.
Z 4in. Easy Bend.
AA Intercepting Trap with Inspection Arm—IA
BB 6in. Drain Pipe to Sewer.
CC 4in. Ventilating Pipe connecting with Air Inlet—DD
DD Front View of Air Inlet shewing 9in. grating.

477 **Channels and Bends,** glazed stoneware. Several specimens (showing various angles and shapes) for use in Inspection chambers. *Doulton and Co.*

478 **Channels and Bends,** glazed stoneware (showing various angles and shapes), for use in Inspection chambers. *Broad and Co.*

479 **Channels and Bends,** glazed stoneware (Winser's), for use in Inspection chambers. *Cliff and Sons.*

480 **Channel,** taper, 6-inch to 4-inch, glazed. *Broad and Co.*

490 **House Drainage** (full-sized model), showing a ventilated soil pipe made in 10lb lead, with astragal and wiped joints and two closet branches, one of which is connected to a lead trap, and the other to a stoneware trap, and both provided with 2-inch anti-syphonage pipes. The soil pipe is connected to a 4-inch stoneware pipe drain. The method of making this important joint is shown in section, the joint is illustrated as being above the ground level, and thus open to inspection. The drain is made with 4-inch tested pipes, with ordinary cemented spigot and socket joints, one portion being bedded *on* concrete, and another portion embedded *in* concrete. The drain (10-feet in length) is laid with a fall of 7 inches, and terminates in an Inspection Chamber constructed with cement floor, glazed channels, glazed brick lining, and covered with (model) air-tight cover. Representations are also given of a 3-inch rain water pipe (in galvanized iron), a 2-inch ventilated bath waste (in lead) with lead trap and bath plug and union, and a 2-inch lavatory waste with hopper head (in galvanized iron). These are collected and discharged into an ordinary glazed stoneware gully with outlet, connected by 4-inch drain to the Inspection Chamber.

The Inspection Chamber is provided with fresh air by means of a flue constructed in 4-inch earthenware pipes, carried below the ground level to a wall near, and terminated with a 9-inch by 9-inch grating. An intercepting trap is fixed at this point with well of trap inside the Inspection Chamber, and provided with an inspection arm for access to the 6-inch drain beyond trap to sewer. This arm is securely stopped with a Stanford jointed stopper, and the trap is so fixed as to be seen in section, from the channel of Inspection Chamber to the connection with the 6-inch drain. This mode occupies about 18-feet on the north side of Museum, and is open to inspection in all its details. A diagram, with full particulars, is placed near the exhibit, and a copy of the same will be found in this catalogue.

491 **Drainage of Museum** (plan) (*near entrance to Museum*), showing the old arrangement of drainage of The Parkes Museum, in direct communication with the sewer. *Rogers Field,* M.INST.C.E.

492 **Drainage of Museum** (plan) (*near entrance to Museum*, showing the new arrangement of drainage of The Parke Museum, as planned by Mr. Rogers Field, M.INST.C.E., and Prof. W. H. Corfield, M.A., M D. *Rogers Field,* M.INST C.E.

493 **Drainage of Museum.** The whole of the sanitary fittings, and the drainage of The Parkes Museum, as illustrated in the plans just mentioned, including lavatory, water closet, urinal, sinks, and rain-water service have been carried out, with a view to make the same both interesting and instructive, and is open for inspection in all its details.

494 **Inspection Chamber** (full sized model), fixed in floor of corridor, fitted with glazed brick sides to channel, glazed channels, intercepting trap, and airtight cover. *Messrs. Broad and Co.*

495 **Air Inlet,** for fixing on a circular pipe, with mica flap to prevent a back draught. *Hayward Bros. and Eckstein.*

496 **Perforated Pipes** (4 and 6-inch), used for subsoil drainage and irrigation purposes. *J. H. Catten.*

497 **Two Asphalte Drain Pipes** found in the course of a house drain, the upper part of each of these pipes has been softened by the warm air in the drain and has bulged downwards from the weight of earth upon it. The only specimen known. *Prof. W. H. Corfield.*

498 **Roots of Tree** (specimen), taken from a 9-inch drain, having evidently found their way through a faulty joint. *Ernest Turner,* F.R.I.B.A.

510 **Soil Pipe,** galvanized. Specimen of 6 ft. length, 4-inch.

oil Pipe, 6 ft. length, 4-inch, treated with the Barff process to prevent oxidation.

512 **Soil Pipe** (two specimens), coated inside and out with Angus Smith's solution ; 4-inch. *Macfarlane and Co.*

513 **Soil Pipe Bend** (drawn lead), 4-inch. *Dent and Hellyer.*

514 **Soil Pipe Joint** (Blair's), forming fresh air inlet. *Blair.*

515 **Soil Pipe** Specimen cut from large soil pipe in use for 20 years, running up five stories and taking four closets one above another and continued up above the roof of building by 4-inch ventilating pipe.

516 **Soil Pipe.** Specimens of lead soil pipe with perforations caused by the action of foul air.

517 **Soil Pipe Joint.** Specimen of defective joint repaired with canvas and red lead.

530 **Rainwater Pipe, rectangular,** 4-inch by 3-inch, with Gregson's hanger, fixed in angle. *J. Gregson.*

531 **Rainwater Bend,** with Gregson's hanger. *J. Gregson.*

532 **Hopper Head,** for 3-inch pipe (Gregson's). *J. Gregson.*

533 **Rainwater Pipes and Hangers** (Gregson's). Several specimens fixed on board, showing various forms of hangers, joints and pipes. *J. Gregson.*

534 **Rainwater Pipe** (Macfarlane's), with ties for brick or stone walls. *Macfarlane and Co.*

535 **Rainwater Collar and Flange** (Law's)

536 **Rainwater Pipes.** Two pipes and shoe (3 by 3), specially treated by the Barff process, to prevent oxidation. *Prof. Barff.*

540 **Manhole Cover,** cast-iron (Botting's), square in form. Fitted with an India-rubber washer and two gun-metal fasteners. *F. Botting.*

541 **Manhole Cover,** cast-iron (Angell's), square in form. Fitted with a joint of plastic material and a gun-metal fastener. *A. T. Angell.*

542 **Manhole Cover,** cast-iron (Durrans'), circular in form, with two lugs for opening. The joint is made by the truly turned surfaces. *T. H. Durrans.*

543 **Manhole Cover,** cast-iron (Broad's), oval in form. This cover may be fitted air-tight if required with plastic composition. *Broad and Co.*

544 **Manhole Cover** (Jones'). Two models, rectangular in form, showing the section of cover, which consists of a lower dome-shaped cover (designed to seal itself by collecting the liquids condensed on its under surface) and an upper cover, with tongue and grooved joint, which may be filled with any plastic material. *J. Jones.*

545 **Manholes and Service Reservoirs** (a series of drawings from designs by Sir Robert Rawlinson) in folio **M.** No. 34 in Catalogue.

546 **Inspection Cover,** cast-iron (Botting's), fitted with India-rubber ring and screw action for making the joint air-tight. *F. Botting.*

550 **Joint for Earthenware to Lead** (two specimens and diagram) (Smith's), one showing lead connection on trap, and the other showing lead connection wiped on to soil pipe. *B. C. Smith.*

551 **Joint for Earthenware to Lead** (three specimens) (Harrisson's).
A Specimen of trap and lead branch fixed.
B Specimen showing flange of trap.
C Specimen showing earthenware flange and lead pipe.
T. Harnett Harrisson.

552 **Joint for Earthenware to Lead** (Bean's). This joint is made with an asbestos or india-rubber ring and Portland cement. *Milne, Son and Macfie.*

553 **Joint for Earthenware to Lead** (model of Water Closet), showing method of jointing lead trap to basin of closet. *Tylor and Sons.*

554 **Ferrules** (copper and brass) for jointing lead soil pipe to earthenware pipe. *Milne, Son and Macfie.*

560 **Smoke Machine** (Watt's Asphyxiator) for testing drains or fumigating purposes. *J. Watts and Co.*

561 **Smoke Machine** (Burn and Baillie's Patent) for testing drains or fumigating purposes. *Burn and Baillie.*

562 **Smoke Machine** (Botting's), for testing drains or fumigating purposes *F. Botting.*

563 **Drain Grenades,** filled with peppermint and other pungent ingredients for testing drains, with apparatus for breaking the same beyond the water seal of any trap. *Banner Sanitation Co.*

564 **Smoke Rockets** (Pain's) for testing drains. *Jas. Pain.*

565 **Drain Stoppers** (Burn and Baillie's), with interchangeable rings, used in testing or stopping drains during repairs. *Burn and Baillie.*

566 **Drain Stoppers** (Botting's Patent) (specimens of 4, 6, and 9-inch) used in testing or stopping drains during repairs. *F. Botting.*

567 **Drain Stopper** (Jones'), (specimen of India-rubber Drain Stopper), with air pump for charging same. Used in testing or stopping drains during repairs. *J. Jones.*

568 **Drain Cleaning Apparatus** (Ashford's), including cane rods, flexible ditto, plunger, duplex roller, spiral screw, archimedian screw, drop scraper, Turk's head and spiral brush. *Ashford and Co.*

569 **Drain Cleaning Apparatus,** including a set of rods, screw and spiral brush. *Ben Reed and Sons.*

570 **Drain Brush,** for cleaning drains. *F. Botting.*

Traps and Gullies.

580 **Bell Trap,** Square, cast iron, with moveable grating.

581 **Bell Trap,** old pattern, with hinged grating. *A. H. Stanbury.*

582 **Bell Trap** (Jennings') (two specimens), showing loose grid and inner cone. *Geo. Jennings.*

583 **Bell Trap** (Jennings' Improved). *Geo. Jennings.*

584. **Bell Trap,** old pattern, with loose grid, very much corroded. *Prof. W. H. Corfield.*

585 **Overflow Trap in Closet, Plug Valve.** *Geo. Jennings.*

586 **Ball Trap** (Bower's), (two specimens), for lavatory waste, with floating ball seal. The glass bell and screw cap are for inspection. *J. Smeaton and Son.*

587 **Ball Trap** (Jennings'), for lavatory wastes, with inspection cap. *Geo. Jennings.*

588 **Cast Lead Traps** (Smeaton's), (three specimens), 4-inch trap for closets, marked A inlet, B outlet. Section of ditto, marked A inlet, B outlet. 2-inch ditto for baths or lavatories. *J. Smeaton and Son.*

589 **Anti-D Traps** (Hellyer's), cast lead (four specimens), designed to prevent siphonage; in sizes suitable for W.C., bath and lavatory wastes. *Dent and Hellyer.*

590 **Drawn Lead Traps** (three specimens), with inspection caps for lavatories, baths and sink wastes. A, 2-inch S trap; B, $1\frac{1}{2}$-inch S trap; C, $1\frac{1}{2}$-inch P trap. *Dent and Hellyer.*

591 **Drawn Lead Traps** (Dubois' Pattern), 4-inch, used for water closets, A, S trap; B, P trap. *Dan. Emptage.*

592 **Brass Trap** (Burn and Baillie's), with union, vulcanite plug, and special inlet from overflow, which is fixed with a movable grid, thus giving access for cleaning. (See complete section, No. 372.) *Burn and Baillie.*

600 **Gulley Trap**, 4-inch, with inlet at back and S outlet. *Doulton and Co.*

601 **Gulley Trap** (section). Stokes, with inspection. *Cliff and Son.*

602 **Rainwater Trap** (Hellyer's), with three connections and grid for surface drainage. *Doulton and Co.*

603 **Trap** (section), with an inlet on sewer side for inspection or anti-siphonage pipe. *Stiff and Sons.*

604 **Gulley**, with P outlet, rebated for grating. *Doulton and Co.*

605 **Anti D Trap**. Stoneware, 4-inch (Hellyer's). *Doulton and Co.*

606 **Gulley**, with dished top and rim to prevent splashing. *Doulton and Co.*

607 **Traps for Sinks.** Three specimens (P, S, and S with inspection). 2-inch, vitrified glazed. *Doulton and Co.*

608 **P Trap**, with reversible top. *Doulton and Co.*

609 **Gulley**. Buff glazed, P outlet, withou rebate for grid. *Broad and Co.*

610 **P Trap.** 4-inch with connection on sewer side for inspection or ventilation. *Doulton and Co.*

611 **Gulley Top**, with channel (Docking's). Designed to meet the requirements of the model bye-laws. *F. R. Docking.*

612 **Rainwater Trap** (Bellman's). With special form of Hopper. *Bellman & Co.*

613 **Yard Gulley**. For intercepting sediment.
A Opening for surface grating.
B Outlet to drain.

614 **Trap** (Mansergh's), with cast-iron grating and cover. *Doulton and Co.*

615 **Gulley** (Dean's) with bucket for removal of deposit.

616 **Grease Trap** (Bolding's), with cast-iron top and gun-metal screw cap for inspection, four 2-inch inlets for waste pipes, and $3\frac{1}{2}$-inch inlet for flush pipe from automatic flush tank. *J. Bolding and Sons.*

617 **Grease Trap**, with two inlets for sink wastes, iron grid, and 3-inch inlet for flushing pipe. This trap is designed to be used with an automatic flush tank. *Bowes Scott and Western.*

618 **Gulley.** Cast-iron (Clarke's), with removable iron bucket. *Clark and Co.*

630 **Disconnecting Trap** (Weaver's). Section marked as follows :—
A Inlet from drain.
B Outlet to sewer.
C Air inlet.
D Inspection or ventilation connection.
Stiff and Sons.

631 **Disconnecting Trap** (Potts'), "The Edinboro'," with channel and cast iron grating for the admission of fresh air at the ground level. *Potts and Co.*

632 **Disconnecting Trap** (Hellyer's), 4-inch, with inlets for soil pipe and two branches, and inspection cap on outlet. *Doulton and Co.*

633 **Disconnecting Trap** (Buchan's), 4-inch. This trap has a 2-inch fall at the inlet for self-cleansing. *J. & M. Craig.*

634 **Disconnecting Trap** ("The Improved Kenon"), (Prof. Corfield's design), specially suitable for deep manholes. The cross section of this trap varies from U shape at the inlet to oval at the well and to O at the outlet, for self-cleansing. *Messrs. Crapper and Co.*

635 **Disconnecting Trap** (Rogers Field's design). This trap is specially designed for use in connection with an inspection chamber (see one fixed in position in model of house drainage). *Broad and Co.*

636 **Disconnecting Trap** (section), (Winser's), with water line of trap indicated. *Cliff and Sons.*

637 **Disconnecting Trap** (section). "The Beancliffe." 4-inch, with the water line of trap indicated. *Cliff and Sons.*

638 **Disconnecting Trap** (Gotto's design), for use at or near the surface, with a specially enlarged air inlet. *Doulton and Co.*

639 **Disconnecting Trap**. Specimen of a defective trap, removed from main drain of a house built in 1884, in a district in the vicinity of London where the model bye-laws are in force. OUTLET 4½ inches HIGHER THAN INLET.

650 **Cast Iron Sink Trap,** with hinged grating on the principle of a dip stone trap.

651 **Zinc D Trap.** Specimen of an old zinc trap with zinc safe combined, and lead and zinc wastes entering trap. *Prof. W. H. Corfield.*

652 **D Trap** (Section). Specimen of an old lead D trap, with waste entering at back below water level.

653 **D Trap** (two Sections), taken from under valve closets. *Dent and Hellyer.*

654 **D Trap.** Specimen showing perforations in the upper part caused by the action of foul air.

655 **D Trap.** Specimen of an old lead D trap with curved outlet.

656 **Trapped Over-flow and Standing Waste** (lead). This specimen was taken from a water cistern; the arrangement at the mouth of the pipe was for excluding sewer-air, but would be ineffective unless supplied with water.

657 **Overflow Trap,** lower part of lead overflow trap.

658 **D Trap** (lead), with two wastes entering below water-level, and small ventilating pipe from top of soil pipe branch.

659 **D Trap** (in glass case), showing collection of deposit below the water level and spots above attacked by foul air. *W. J. Bassett.*

660 **D Trap** (heavy), showing connection for waste pipe below water-level

661 **Improved Lead D Trap,** with two wastes entering below the water-level, showing an attempt to improve the old form of D trap to make it self-cleansing.

662 **P Trap, Lead.** Specimen with waste pipes connected. *W. Eassie,* C.E.

663 **P Trap, Lead.** Specimen with three wastes connected. *W. Eassie,* C.E.

664 **D Trap, Lead.** This lead connected with zinc soil pipe, the upper part of the pipe being destroyed by perforation, removed from a country house. *Ernest Turner,* F.R.I.B.A.

665 **Dip Trap** (sheet lead), removed from under the floor of a pantry in a country house; the waste pipe from the pantry sink discharged into it. The trap was supported by a wooden casing. *Prof. W. H. Corfield.*

666 **Faulty Joint** (specimen) showing faulty joint connecting iron and lead pipes.

Dry Closets.

680 **Portable Commode** (Moule's), with hopper for dry earth, ashes, or other material used, mechanical spreader for same, and a receptacle for excreta. *The Moule's Patent Earth Closet Company, Limited.*

681 **Portable Commode,** with Hopper for dry earth, ashes, or other material used, mechanical spreader for same, and a receptacle for excreta. *John Parker.*

682 **Ash Closet,** cinder-sifting, self-acting (Morrell's), half sized model *Morrell's Sanitary Appliance Company.*

683 **Privy, Cottage** (model), showing system of ventilation adopted by medical officer of health for the West Kent Sanitary District. *C. O. Baylis,* M.D.

Sewage Treatment and Disposal.

690 **Oak Pail,** with spring lid, for removing excreta, where a system of periodic collection is adopted. *B. B. Haresceugh and Co.*

691 **Galvanized Iron Pail,** with spring lid, for the periodic collection of excreta. *E. Morris and Sons.*

692 **Galvanized Iron Pail,** with cam action lever for pressing down the lid and making it air-tight

693 **Hose Connections.** Two specimens (Talard's), used for connecting the hose of receiver to the hose of cesspool, where the periodic emptying of the cesspool is effected by suction into an air-exhausted tank or receiver, a system which is in operation at Paris and other Continental towns.

694 **Valve,** used in drains where sewage is disposed of by irrigation.

695 **Sludge** (three samples in bottles), showing the condition of sludge after treatment, taken from the Leyton sewage works.

696 **"Shone" Hydro-Pneumatic Sewerage and Water Supply** (two diagrams). In this system of distributed stations for the lifting of sewage, worked from one central station by means of compressed air, the whole drainage area is divided into a number of districts, each with its separate outfall and discharging station, operated by means of an ejector; the discharge from all the stations converging into one common main leading to the common outfall. The ejector is a large closed iron vessel worked automatically by compressed air. The same principle is applied to water supply, the compressed air imparting the necessary "head" for supply in lieu of natural "head" from water tower or high reservoir. *Hughes, Lancaster, and Co.*

697 **Sewage Disposal by Sub-Irrigation.** A working model. The slop-water from a sink is collected in an automatic flush tank, and thence discharged into open-jointed pipes laid below the surface of a garden, when the sewage will force itself out of the joints into the soil and feed the vegetation. The arrangement shown is only suitable for slop-water from cottages, but, by a special modification, it can be made available for the entire sewage of a country house. For a detailed description of Sub-Irrigation, see "International Health Exhibition Handbook," vol. I., page 281. *Rogers Field,* M.INST.C.E.

CLASS III.—HEATING, LIGHTING AND VENTILATING.

Several of the most important features in this Class are practically illustrated by appliances fixed in various parts of the buildings in actual use, including gas, coal, open and closed stoves, several patent gas burners and ventilators.

THE CLASS IS ARRANGED UNDER THE FOLLOWING SUB-HEADS:—

Heating Apparatus.	Lighting, including Electric Lighting.
Cooking Apparatus.	Ventilating Gas Burners.
Smoke preventing Appliances.	Ventilators.

Heating Apparatus.

710 **Gas Stove,** "The Gurney" (Southby's). *The London Warming and Ventilating Company.*

711 **Gas Stove,** "Lux Calor," for lighting and warming small compartments. This has no flue to remove the products of combustion. *Ritchie and Co.*

712 **Gas Stove,** "The Calorigen" (George's), with flues for the inlet of fresh air and the outlet of waste products. *J. F. Farwig and Co.*

713 **Gas Stove,** "The Calorigen" (George's), with flues for the inlet of fresh air and the outlet of waste products, fitted up in working order in the Secretary's office. *J. F. Farwig and Co.*

714 **Gas Fire** (Fletcher's New Incandescent Ball Fire, with Regenerator), with asbestos fibre above the burner, which becomes incandescent and both aids the combustion and gives a cheerful appearance. *Thos. Fletcher and Co*

715 **Gas Stove,** "The Euthermic" (Dr. Bond's), fitted in corridor, with flues for the inlet of fresh air (which is warmed and distributed) and for the outlet of waste products. *Dr. F. T. Bond.*

716 **Gas Stove** (Cox's), a large circular stove provided with inlet for fresh air and outlet for waste products. *Cox and Co.*

717 **Gas Fire** (Fletcher's) (small), a larger specimen of these gas fires is fitted up in working order in the Secretary's office. *Thos. Fletcher and Co.*

718 **Oil Stove,** "Lux Calor" (Ritchie's), for lighting and warming small compartments. *Ritchie and Co.*

719 **Oil Stove,** for greenhouses, with an arrangement of pipes for distributing heat by means of the circulation of hot water. *S. P. Catterson.*

720 **Chaufferette, or Foot Warmer,** used by stall women and lodge keepers at Paris, with specimen of charcoal used. *T. Twining.*

721 **Ventilating Stove** (Sir Douglas Galton's design). *Yates, Haywood and Co.*

722 **Slow Combustion Stove.** *Barnard, Bishop and Barnard.*

723 **Grate,** designed by T. Pridgin Teale, with closed air chamber below fire, for economy of fuel.

724 **Convoluted Stove,** arranged to give a large heating and radiating surface to each square foot of grate space. *Joseph Constantine.*

725 **Hygiastic Ventilating Fire Grate,** as used by the London School Board. *D. O. Boyd.*

726 **Fireclay Grate,** with register. *F. Edwards and Son.*

727 **Stove,** Woodcock's improved Gurney, circular in shape, with sliding doors and flanges for radiating heat. *London Warming and Ventilating Company.*

728 **Tubular Pillar** for hot water or steam. *Jones and Attwood.*

729 **Ventilating Block and Lintel Flue,** fireclay. *Geo. Jennings.*

730 **Ashes in Glass Bottles.** Showing the result of 42 hours' burning in an ordinary stove, fitted with a Pridgin Teale's economiser and also the result of $\frac{1}{3}$ day without economiser. *T. Pridgin Teale.*

731 **Fuels.** A selection of various kinds of coal, coke, peat, and patent fuels. *Rickett, Smith and Co.*

732 **Smokeless Fuel.** *Peters, Bartsch and Co.*

733 **Frost-defying and non-evaporating Liquid** (Patent), for distributing heat, cold or pressure and for maintaining a regular water line in wet gas meters. *W. Stainton.*

734 **Asbestos Fibre,** used in gas fires for producing a cheerful appearance.

735 **Asbestos Lumps,** used in conjunction with gas for making gas fires.

736 **Asbestos,** for packing pipes and flues, for preventing the radiation of heat, and protecting adjacent wood or other materials.

737 **Flue Elbows, Adjustable** (six specimens) in various sizes.

738 **Fireclay Flue** (circular), 9-inch. *Doulton and Co.*

739 **Fireclay Flue** (circular), with outer casing (square), 9-inch. *Geo. Jennings.*

740 **Flue** (square), with tiles, inlet in front.

741 **Flue** (circular), stoneware.

742 **Water Heater,** Instantaneous (Fletcher's). (Fixed over bath in corridor.) This heater is provided with a powerful atmospheric gas burner, which raises the temperature of water from 60 degrees to 110 degrees, at the rate of about two gallons per minute. A flue is also provided for carrying off the waste products from the gas. *Thomas Fletcher & Co.*

743 **Stove Ventilating, Glazed Terra Cotta,** decorated, with feed door and regulating air inlet, giving control over the rate of combustion. *Doulton & Co.*

744 **Stove Ventilating,** fixed on ground floor of Museum. Iron, with feed hopper and air valve for regulating the rate of combustion. The front of this stove is fitted with mica, enabling the fire to be seen. *Rosser and Russell.*

745 **Grate, Glazed Terra Cotta,** complete with mantel, shelf, hearth, and fender. Fixed and used at platform end of Museum. *Doulton and Co.*

746 **Grate,** designed to combine the advantages of open and closed fire, fixed in library. *H. Heim.*

Cooking Apparatus.

760 **Oil Cooking Stove** (Rippingille's). Two 6-inch burners, cast-iron top, with oven and two boiling openings. *The Albion Lamp Co., Limited.*

761 **Gas Cooking Stove** (Fletcher's), with grill, hot plate, large oven, and packed, double, non-conducting casing. Porcelain enamelled. *Thos. Fletcher and Co.*

762 **Kettle** (Quelch's), enamelled.

763 **Saucepan** (Keen's), enamelled with ventilated lid. *A. G. Keen.*

764 **Grill,** enamelled.

765 **Coffee Pots** (five specimens), showing various forms of lamps, and arrangements for making coffee. *T. Twining.*

Smoke Preventing Appliances.

Gas Stoves and Gas Fires. *See* Heating Apparatus

Smokeless Fuels. *See* No. 732.

Lighting.

790 **Reflector** (Chappuis'). For reflecting daylight or artificial light. *Chappuis and Co.*

791 **Pavement Lights** (Hayward's). Specimen of lens lights fixed in floor of gallery. *Hayward Bros. and Eckstein.*

792 **Pavement Lights** (Hyatt's). Two specimens fixed in floor of gallery. *J. Hyatt.*

793 **Pavement Lights** (Hyatt's). Specimen with octagon lights and octagon tiles inlaid between. *J. Hyatt.*

794 **Prisms and Lenses** for pavement lights, various shapes for directing the light into particular directions. *Hayward Bros. and Eckstein.*

800 **Gas Burner** (Sugg's). Group of 9 table-top burners. *W. Sugg and Co.*

801 **Gas Burner** (The Wenham), fixed in roof of Museum, with by-pass for self-lighting. *The Wenham Co.*

802 **Gas Burner** (Siemen's), fixed in roof of Museum with by-pass for self-lighting.

803 **Gas Burner, Incandescent,** fixed on bracket at end of Museum under gallery and in Experimental Corridor. *The Incandescent Lamp Co.*

804 **Gas Burners, Regulating** (Sugg's), four fixed in side corridor. *W. Sugg and Co.*

805 **Gas Burners, Reflex.** Two 6-light and one 8-light burners fixed in Library. *J. Stott and Co.*

806 **Gas Meter, Dry** (Glover's). 80 lights fixed at entrance to Museum.

807 **Gas Regulator.** Section showing internal arrangements for diminishing the inlet of gas as the pressure increases. *Shaw and Son.*

808 **Gas Regulator** (Stott's). Two specimens, one fixed near gas meter at entrance, controlling the gas supply of Museum. *J. Stott and Co.*

809 **Gas Valve.** (Joy's). Safety valve for regulating the gas supply. *W. H. Coulter.*

820 **Lamp for Mineral Oil** (Shaftesbury Safety), hand lamp and standard lamp, with automatic cap for extinguishing the lamp if upset. *Shaftesbury Lamp Co.*

821 **Lamp for Mineral Oil** (Defries' Safety), with metal reservoir, and wick encased in tube (*See* No. 824). In the Standard lamp air is supplied to the middle of the flame by means of a tube passing through the oil reservoir. In the hand lamp an automatic safety cap is added.

822 **Oil Lamp** (the Wanzer), fitted with a mechanical arrangement to supply air to the point of combustion, dispensing with the necessity for a chimney. *The Wanzer Lamp Co.*

823 **Oil Lamp,** with metal reservoir and casing tube to lower part of wick.

824 **Oil Lamps,** three specimens of cheap lamps. The proximity of the flame to the reservoir, and the imperfect fitting, which allow vapour from the lamp to reach the flame, render lamps of this form dangerous. In one of the specimens the danger is greatly lessened by the addition of a safety tube enclosing the wick nearly to the bottom of the oil reservoir, so as to prevent the vapour from the surface of the oil rising up beside the wick.

830 **Glazing.** Lantern over entrance corridor, showing method of glazing without putty. *The Britsh Patent Glazing Company.*

Windows. Several models of windows will be found in Class I. ("Construction"), illustrating the methods adopted for lighting and ventilation at the principal London hospitals.

Ventilating Gas Burners.

840 **Gas Burner, Pendant, Ventilating.** Three specimens fixed in entrance corridor, connected to shafts for carrying off the products of combustion. *Benham and Sons.*

Ventilators.

850 **Fresh Air Ventilator, Inlet** (Crosse's), fixed in model wall with tray for deodorant. *H. W. Crosse.*

851 **Circular Ventilator,** "The Universal," for fixing in window. *Capt. Wintour.*

852 **Ventilator,** designed by Dr. Langstaff, for disinfecting and ventilating purposes and for the treatment of disease. *C. Langstaff,* M.D.

853 **Ventilating Tube** (Livesey's), with inlet grating and screen.
A.—Angular fixed near door of Museum.
B.—Rectangular.
Sanitary Engineering and Ventilating Co.

854 **Ventilators** (Currell's).
A.—Door Inlet for Stables (fitted to Model Door).
B.—Window Inlet (fitted to Model Sash Bar).
C.—Window and Door Inlet (Brass).
D.—Window Inlet, fitted to Model Sash Bar.
E, F, G.—Other forms of Window and Door Inlets.
W. Tonks and Sons.

855 **Ventilating Fan** (model), for mechanically producing movements of air. *General Franzini.*

856 **Ventilator** (Eyre's), inlet or outlet, with flap to prevent back-draught. Two specimens 9in. by 3in. and 9in. by 6in.

857 **Ventilator, Bracket, Inlet** (Currah's). Two specimens, plain and ornamented, with regulating valve and indicator. *Baxendale and Co.*

858 **Ventilator and Radiator** (Ellison's), drawer shaped, with divisions to divert the current of air. *J. E. Ellison.*

859 **Ventilators** (Crossley's).
A.—Louvre Inlet. | B.—Louvre Outlet, with Regulator.
C.— Valve (Outlet), self-acting.
D. Crossley.

860 **Ventilator** (Arnott's). *Hart, Son, Peard and Co.*

861 **Ventilator** (McHaffie's), designed to be self-regulating against excessive external pressure. *Hart, Son, Peard and Co.*

862 **Ventilators, Sliding, or Hit-and-Miss,** for the admission of air through floors or skirtings. *Hart, Son, Peard and Co.*

863 **Ventilator, Drawer shaped, Inlet,** with separate channels for difusing the air, and screen for cleansing the same. *C. R. Stevens.*

864 **Ventilators, Conical** (Ellison's).
A.—Model of Skirting, perforated with conical holes.
B.—Terra-cotta Air Grating, with conical holes.
C.—Conical Air Brick, ditto Section, and Apparatus for demonstrating the efficiency of this method of introducing air without draught.
J. E. Ellison.

865 **Air Grating, Terra cotta.**

866 **Air Gratings, Iron.** Three specimens.

867 **Ventilating Bracket,** with air cleansing water box and hinged air grating (fixed near entrance to Museum). *Sanitary Engineering and Ventilating Co.*

868 **Mica Flap Ventilator** (Hayward's), frequently used as an inlet to a flue where a back draught is undesirable. *Hayward Bros. and Eckstein.*

869 **Mica Flap Ventilator** (Hayward's), with hit-and-miss arrangement to control the action of the same. *Hayward Bros. and Eckstein.*

870 **Sherringham's Improved Ventilator** (Hayward's), with cord and handle for opening and closing. *Hayward Bros. and Eckstein.*

871 **Ventilator, Louvre** (Hayward's), with ratchet actio for opening and closing. This ventilator can be reversed to act as an inlet. *Hayward Bros. and Eckstein.*

872 **Ventilator, Louvre** (Hayward's), with circular action for opening and closing. This ventilator can be reversed to act as an outlet. *Hayward Bros. and Eckstein.*

873 **Air Inlet-Tube,** made in cast-iron, with regulating valve and access door at foot for clearing. *Hayward Bros. and Eckstein.*

874 **Ventilating Cowl** (Jones'). 3-in. single chamber and 3-in. double chamber. *J. Jones.*

875 **Revolving Ventilating Cowl.** *Scott, Dunn and Co.*

876 **Revolving Ventilating Cowl** (Scott's).

877 **Revolving Ventilating Cowl** (Howorth's). Model with glass panel, showing internal arrangement of archimedean screw. *Jas. Howorth.*

878 **Up-cast Ventilating Cowl** (Kite's), 3-inch. *Kite and Co.*

879 **Air Pump** (model) (Boyle's). *Boyle and Co.*

880 **Air Exhaust** (models) (Buchan's). *W. P. Buchan.*

881 **Air Exhaust** (model) (Hall's). *D. T. Bostel.*

882 **Ridge Tile Ventilator**, Terracotta.

883 **Ridge Ventilator** (Hamilton's), for fixing in ridge of roof.

884 **Window Ventilator** (Cooper's), model showing revolving disc and hit-and-miss arrangement. *Cooper and Co.*

885 **Window** or **Door Ventilator** (Cooper's), model showing louvre and method of opening. A larger specimen is shown in action in entrance door of Museum. *Cooper and Co.*

886 **Window Ventilation,** model of window with simple costless ventilator applied. *P. Hinckes Bird*, F.R.C.S.

888 **Cowl,** with bird's nest. Removed from the top of a lead soil pipe *J. H. Catten.*

Window Construction for Ventilation, &c. Several models of windows as constructed for and in use at the principal London Hospitals, including St. George's, Middlesex, St. Thomas's, Guy's, and London. *See* Nos. 100 to 107 of this Catalogue.

Ventilated Lid for Water Closets (designed by H. Saxon Snell, F.R.I.B.A.) *See* No. 115.

Ventilation of War Ships. A series of drawings of H.M.S. *Agincourt, Victor Emanuel, Dreadnought, and Indian Troopships* (large scale), illustrative of the systems of ventilation carried out on these vessels. *See* No. 34. Folio **T.**

Ventilation of Public Buildings. Drawings. *See* No. 34, Folio **U.**

Ventilation of Prison. *See* model No. 36.

Ventilation of House Drains, Closets, Soil Pipe, Inspection Chamber. *See* full-sized model, No. 490.

Ventilating Stoves and Grates. *See* Heating Apparatus.

Air Inlets for House Drainage, with mica flap to prevent back draught (*see* drain accessories on pages 30 and 32).

DIVISION D.

PERSONAL AND DOMESTIC HYGIENE.

The section devoted to Foods has been specially arranged by Mr. Thos. Twining, of Twickenham, and nearly the whole of the specimens exhibited in this section are presented to the Museum by him.

THE DIVISION IS ARRANGED UNDER THE FOLLOWING HEADS :—

Clothing.
Beds and other Furniture.
Hospital and Sick Room Appliances.
Domestic Appliances.
School Fittings.
Gymnastic Apparatus.
Foods.
Domestic Filters.
Mineral Waters.
Soaps and other Detergents.
Antiseptics and Disinfectants.
Disinfecting Apparatus.

Clothing.

900 **Funeral Cloaks.** Two specimens with hoods for protecting the head in inclement weather. *T. Twining.*

901 **Nottingham Scarf.** Three specimens with model to illustrate the method of using same. *T. Twining.*

902 **Manchester Goods.** Two specimens of this material, one as sent out from the maker, the other, 76½ square inches, after washing, showing a loss in weight by washing equal to 221 grains

903 **"Edith" Corset,** pure woollen, long waist.
904 **"Alexandra" Corset,** pure woollen knitted.
905 **Ladies' Vest,** double-breasted, short sleeves.
906 **Ladies' Night Dress,** pure woollen, warm.
907 **Ladies' Combination Garment,** pure woollen, light and warm.
908 **Pure Woollen System of Clothing.** Dr. Jaeger's book describing same.

Jaeger's Sanitary Woollen System Co

909 **Ladies' Combination Garment,** cellular cloth, cotton, porous. *Cellular Clothing Co.*

910 **Cellular Cloth.** Pattern book with pamphlet describing same. *Cellular Clothing Co.*

911 **Diagram** of natural waist and waist contorted by tight lacing.

912 **Child's Shoes,** with ordinary pointed toes. *Dowie and Marshall.*

913 **Child's Shoes,** made to fit a natural-shaped foot. *Dowie and Marshall.*

914 **Cast of Child's Foot.** Copy of child's foot in its perfect natural state. *Dowie and Marshall.*

915 **Skeleton of Foot,** showing the bony arch of foot with its two abutments, one at heel and the other at great toe joint. *Dowie and Marshall.*

916 **Ladies' Boots,** with high heels and pointed toes. *Dowie and Marshall.*

917 **Diagrams** (three), showing the defects in the ordinary shaped boots, and their unsuitability.

918 **Cast of Foot,** showing the malformation of great toe joint through wearing the ordinary pointed boots. *Dowie and Marshall.*

919 **Cast of Foot,** with sandal, showing the perfect development of foot. *Dowie and Marshall.*

920 **Boots, Men's,** patent leather, with ordinary pointed toes. *Dowie and Marshall.*

921 **Boots, Men's,** with inner line straight to allow the great toe to retain its natural shape. *Dowie and Marshall.*

922 **Hose,** with separated toe-spaces, made in natural undyed wool. *Jaeger's Woollen Clothing System Co.*

Beds and other Furniture.

940 **Eider Down Quilt,** with holes for ventilation.

941 **Blanket Chartaline.** *H. Leigh Slater.*

942 **Bed** (model). Woollen flock. *Gainsford and Co.*

943 **Mattress** (model). Woollen. *Gainsford and Co.*

944 **Mattress** (model). Hair, *Gainsford and Co.*

945 **Chain Mattress,** (model), on strong wooden frame, with arrangement for tightening same. *Chorlton & Dugdale.*

946 **Iron Bedstead** (model), with sloping canvas, on wheel and ratchet roller for tightening same. *Thos. Allen.*

947 **Seat,** on hinged pedestal, for economising space. Designed for use in shops for attendants. *Colman and Glendenning.*

948 **Reclining Chair,** Liebrich's design. *Callaghan and Co.*

Hospital and Sick Room Appliances.

960 **Bed Pan** (earthenware), for the sick room. *Dr. J. C. Steele.*

961 **Bed Slipper** (earthenware), for the sick room. *Dr. J. C. Steele.*

962 **Bed Urinals** (two specimens) (earthenware), for the sick room. *Dr. J. C. Steele.*

963 **Trays** (earthenware), used in dressing wounds for ordinary surgical operations. *Dr. J. C. Steele.*

964 **Tray** (ebony), used in dressing wounds for ordinary surgical operations. *Dr. J. C. Steele.*

965 **Nursery,** or **Travelling Convenience.** *J. Allen and Son.*

966 **Bandage Winder** (model). *Dr. J. C. Steele.*

967 **Bedpan Cage** (model), used for keeping stools for inspection of medical men. *N. H. Nixon, Secretary, University College Hospital.*

968 **Tubular Bed** (model). *Pocock Bros.*

969 **Invalid Apparatus** (model), for enabling an invalid to raise himself in bed.

970 **Bed Rest** (model), with foot rest. *N. H. Nixon, Secretary University College Hospital.*

971 **Vaporiser,** with lamp. *Jas. Allen and Son.*

972 **Vaporiser,** for use in the sick room. *Jas. Allen and Son.*

973 **Ambulance Carriage** (model) as used at the Middlesex Hospital.

974 **Lamp** for generating heat with safety under bedclothes. *Dr. J. C. Steele.*

975 **Turkish Bath Apparatus,** portable, for use in sick room. *Jas. Allen and Son.*

976 **Folding Shade,** portable, for protecting persons with weak eyes from strong lights. *T. Twining.*

977 **Guide and Rest** for assisting the short sighted in writing. *T. Twining*

978 **Chair** with simple contrivance for carrying invalids. *T. Twining.*

979 **Crutches.** Two specimens of India rubber ends for crutches.

980 **Crutches,** cheap, improved (three specimens). *T. Twining.*

981 **Mesopodium,** or **Saddle Stick** (five specimens), for supporting the weight of the body when using crutches. *T. Twining.*

Domestic Appliances.

990 **Hygienic Towel** (Fell's), designed to retain its frictional qualities when wet or dry, and to lose none of these qualities by ordinary wear. *Fell and Co.*

991 **Flesh Gloves** (Fell's), designed to retain their frictional qualities wet or dry, and for their whole useable period. *Fell and Co.*

992 **Coal Box** (model), suitable for public buildings, forming a convenient seat. *Dr. J. C. Steele.*

993 **Destructor for House Refuse** (model) (Tupper's Patent), showing its adaptation to an ordinary kitchen range. *W. Tupper.*

994 **Ash-Bin and Sifter** (model). Suitable for large institutions.

995 **Dust Shoot** (Smeaton's). *J. Smeaton and Sons.*

996 **Sash and Picture Line** (Hookin's), various specimens of new and one specimen of old. *W. Tonks and Son.*

997 **Butter Cooler and Butter Dishes,** various simple and inexpensive forms. *T. Twining*

998 **Iron Stand for Laundry Purposes.**

999 **Foot Warmer,** filled with chemical heat-retaining fluid. *Peters, Bartsch and Co.*

Self-Locking Coal Plates. Two models and one actual size, with glass top. (*See* also No. 115).

School Fittings.

1000 **School Desks and Seats.** A set of models showing

Adjustable chair and desk.
Seat and desk.
Two form of seats.
Long form seat with desk.
Desks, single with and without seats.

Colman and Glendenning.

1001 **Seat** (model), for school yards, parks and recreation grounds. *Colman and Glendenning.*

Demonstration Models. "The South Kensington Lecture Cabinet." *See* No. 19

Demonstration Model of House Sanitation. *See* No. 20.

Gymnastic Apparatus.

1010 **Home Gymnastics Apparatus** (Bacon's), with pamphlet of instructions based upon Dr. Schreber's system. *G. W. Bacon and Co.*

1011 **Models,** illustrating the elementary movements of the body, used in the physical education of the blind. *Dr. Roth.*

Foods.

NOTE.—All exhibits in this section, not otherwise marked, have been presented by *Mr. Thos. Twining, of Twickenham.*

1020 **Preserved Meats** (*Two Cases*). Various specimens, including edible bird's nests, soups, extracts, beef, veal, mutton, pork, bacon, sausages, hare, rabbit.

1021 **Fish, Crustacea and Mollusca.** Various specimens in bottles, with shells of oyster, whelk, cockle, razor fish, scallop, &c.

1022 **Eggs, Butter and Cheese.** Various specimens of each, with models of apparatus used in the manufacture of cheeses on the continent.

1023 **Cereals** (*Two Cases*), including wheats (various), flours and preparations from wheat, brans, hominy, macaroni, vermicelli, rye, barley, oats, oatmeal, rice, maize, millets, penicillaria, manna kroup, dari.

1024 **Breads.** Various kinds of bread, dough raisers and flour adulterants, including specimen of bread used during Siege of Paris, 1870, pumper nickel, &c.

1025 **Biscuits.** Various kinds.

1026 **Rice and Wheat.** Various samples.

1027 **Cereals in their natural state**, including wheat, Egyptian wheat, rye, barley, oats, maize (various), penicillaria, sorghum, morbete.

1028 **Cereals.** Showing the comparative analyses of buckwheat, quinoa, durra, rice, millet.

1029 **Legumes, Roots, &c.** Showing the comparative analyses of peas, haricots, lentils, potatoes.

1030 **Cereals and Pulse.** Various samples, principally British Indian.

1031 **Pulse, &c.** (*Two Cases*), peas, lentils, beans, haricots, Indian pulse, amaranthus quinoa, buckwheat, asparagus, potatoes, including a number of models, presented by *Sutton and Sons.*

1032 **Roots and Bulbs**, potatoes, artichokes, turnips, kohlrabi, parsnips, salsify, beet, leeks, onions, carrots, oxalis, radishes, mandioc (specimens of the Colorado or potato beetle).

1033 **Salads, &c.**, cryptogams, tomatoes, marrow, cucumber, gherkin, Brussels sprouts, celery, spinach, lettuce, watercress, endive, colewort. Several of the specimens are represented by models presented by *Sutton and Sons.*

1034 **Vegetables** (models). Including parsnip, cauliflower, savoy, melon, carrot, cabbage, vegetable marrow, cucumber, Egyptian turnip, onion, leek. *Sutton and Sons.*

1035 **Milks.** Showing the constituents of the following milks, cow's, woman's, goat's, ass', mare's. *Aylesbury Dairy Co., Ltd,*

1036 **Uncommon Foods, &c.** Including cinchona, Japanese isinglass, tonquin bean, odika bread, guava jelly, oil palm, kola, papain, coca, pemmican, capraria, yerba mate, kokum-butter pepper stick, &c. *Thos. Christy and Co.*

1037 **Miscellaneous** (specimens). Including cereals, pulse, oils, fibres, dyes. *Carter and Co.*

1038 **Food for Invalids and Infants.** Including various diabetic preparations. *G. Van Abbott and Son.*

1039 **Fruits, Preserved** (*Two Cases*), including bergamot, chinensis, bread fruit, bingai, citron, mangosteen, pineapple, persea gratissima, custard apple, betel nut, jack fruit, lemons, oranges, figs, litchi, crab oil, lansat, mangoes, guava, grapes, etc. Durion, pine, mamey, forbidden Fruit, cacao pod. *Kew Museum of Economic Botany.*

1040 **Fruits** (preserved, and models). Including bergamot, lime, lemon, pine, banana, oranges, pomegranate, olives, grapes, sultana, muscatels, raisins, currants, figs, mulberry, date, cherries, plums apricots, pears, apples, pippins, cranberries, hips and haws, raspberries, strawberries, gooseberries, &c.

1041 **Nuts** including Brazil, almonds, Sapucaya, Spanish, Kentish, walnuts, chestnuts, dika, hickory, peggan, earth, caju, cocoa, pine, Suwarrow, nelumbum, pachyma, cocos.

1042 **Tropical Fruits** including bread fruit, peach, longans, buah Malakka, lansat, carambola, mango, elephant apple, quince, egg plant, tamarinds, ber fruit, custard apple, gombo.

1043 **Secreted and Extracted Products** (*Two Cases*). Divided into sections, including starch, gluten, gum, sugar, honey.

1044 **Cakes**, various kinds.

1045 **Sweetmeats.** Various specimens, including specimens of colouring matter used in their manufacture.

1046 **Raw Sugars** various kinds, with descriptive and coloured diagrams, showing the sugar plant and sections of cane.

1047 **Flavouring Herbs.** Including basil, mint, thyme, savory, marjoram, sage, hyssop, parsley, mangold, saffron, fennel, caraway, dill, cumin, coriander.

1048 **Condiments,** including vinegars, sauces, pickles, fats and oils.

1049 **Stimulants and Spices,** including mustards, turmeric, cardamoms, capsicums, chillies, pepper, cloves, cinnamon, ginger, nutmeg, cassia.

1050 **Narcotics** and **Masticatories**, including various kinds for smoking, snuffing and masticating.

1051 **Spices, Condiments and Herbs**, with specimens of various tobacco leaves and coloured drawings of plants.

1052 **Beverages** (*Three Cases*), including teas, coffees, cocoas, chicory, chocolate, and adulterants.

1053 **Refreshing Drinks** (*Two Cases*), including fruit syrups, magnesia, orgeat, liquorice, cream of tartar, pearl barley.

1054 **British Wines**, various.

1055 **Fermented and distilled Liquors** (*Two Cases*), including malt, hops, ales, liquors, liqueurs, cordials, flavourers.

1056 **Physiological Diagrams.** Illustrating the structure of the human body, including skeleton, skin, and organs of touch, nails and hair, arterial and venous blood, cellular structure, jaws and teeth, alimentary canal.

1057 **Thermometric Scales.** Diagrams (large and small) showing comparative readings of Fahrenheit, Reaumer and Centigrade.

1058 **Animal Kingdom.** Diagrams illustrating the scientific classification into sub-kingdoms, provinces, classes, and orders.

1059 **Animal Kingdom.** Coloured drawings of mammalia, birds, bees, reptiles, fishes, crustacea, &c.

1060 **Vegetable Kingdom.** Diagrams, illustrating the scientific classification into sub-kingdoms, divisions, classes, sub-classes, orders, and sub-orders.

1061 **Vegetable Kingdom.** Coloured drawings of condiments, fruits, fungi.

1062 **Food Analyses.** Tabulated Cards, showing constituent elements of various foods, daily supply and waste, day's rations, &c. *South Kensington Museum.*

1063 **Butchers' Joints.** Diagram showing principal joints in ox, calf, sheep and pig.

1064 **Meat and Bone.** Diagram showing proportionate weight of meat and bone in principal joints of beef, mutton, and veal.

1065 **Cereals.** Table showing proximate analyses of important cereals.

1066 **Flour Mill.** Diagram showing in section the process of flour making.

1067 **Malting and Brewing.** Diagram showing in section the processes of malting and brewing.

1068 **Constituents, Average of.** Table showing the proximate average percentage of constituents in various food articles.

1069 **Altitudes.** Diagram showing comparisons of heights at which various kinds of vegetation exist.

1070 **Wines.** Geographical classification.

1071 **Roots and Bulbs** (diagram on roller). Showing analyses of various kinds.

1072 **Vegetables** (diagram on roller). Showing analyses of various kinds.

1073 **Fruits** (diagram on roller). Showing analyses of various kinds.

1074 **Food and Nutrition,** an introduction to the food section of the Parkes Museum, by T. Twining.

1076 **Mammalia.** Coloured drawings—classified.

1077 **Birds.** Coloured drawings—classified.

1078 **Fish.** Coloured Drawings—classified.

1079 **Food-producing Plants** (folio **V.**), including roots and bulbs, cereals, fruits, starches, herbs, beverages, spices, liquors, oils.

1080 **Food Tables, Tablets and Diagrams** (folio **W.**). *South Kensington Museum Committee.*

1081 **Vegetable Physiology** (folio **X.**). Diagram showing germination, cellular tissue, systematic botany, &c.

1082 **Microscopic Diagrams** (folio **X**.). Showing enlargements of the following, cinnamon powder and wheat flour, oatmeal, wheat flour, marmalade, coffee, potato, mustard, peppers arrowroots, chicory, ginger, liquorice powder and wheat flour, rice flour, cocoa and potato flour, oatmeal with barley meal, rhubarb and wheat flour, cocoa, Chinese powder, la veno beno, cheese acarus, annatto sugar insect old and young, liquorice and cammony, jalap, opium, coffee, and milk. *Arthur Hill Hassall*, M.D.

Domestic Filters.

1100 **Filter, Natural Stone and Carbon.** *T. Barstow.*

1101 **Filter Rapide.** Two specimens. *Maignen and Co.*

1102 **Filter, Manganous Carbon,** with ornamental Doulton ware exterior. *Doulton and Co.*

1103 **Filter, Manganous Carbon,** small ornamental. *Doulton and Co.*

1104 **Filter** (section). *London and General Water Purifying Co.*

1105 **Filter** (section), large size. *The Sanitary Engineering and Ventilation Co.*

1106 **Filter, Spongy Iron** (model), showing arrangement of filtering, medium and internal construction. *Spongy Iron Co.*

1107 **Filter, Carbon Block** (model). *F. H. Atkins.*

1108 **Filter, Collapsible Bucket,** for packing in small compass when not in use.

1109 **Filter, Table,** in glass with carbon block and special arrangement to prevent the water running when top is removed off the reservoir. *Sanitary Engineering and Ventilation Co.*

1110 **Filter, Table,** with carbon block. *Sanitary Engineering and Ventilation Co.*

1111 **Filtering Mediums.** Glass case containing specimens of various materials used in filtering water, including animal, vegetable and mineral carbons.

1112 **Filter, Pasteur Tube.** Specimen. *Pasteur Filter Co.*

1113 **Filter, Carbon Block,** suitable for travellers. *Silicated Carbon Co.*

1114 **Diagram,** showing adaptation of Filter to house supply. *Maignen and Co.*

1115 **Water Storage Can,** designed for use in the country.

1116 **Filter.** Small model of spongy iron, showing filtering medium, its disposition, and the means of access for cleaning. *Spongy Iron Co.*

1117 **Filter** (Section under glass shade), showing filtering medium, method of placing the same, and the facilities for cleaning each part.

Mineral Waters.

1130 **Mineral Waters.** Specimen bottles of various English and foreign kinds, including St. Galmier, Giesshübler, Rakvezy, Rubmat, Vals, Salutaris, Cheltenham, Bilau, &c.

Soaps and other Detergents.

1140 **Soaps and other Detergents.**

1. Substances used in the manufacture of soap, including palm oil, Australian tallow, cocoanut oil, cottonseed oil, whale oil, glycerine, castor oil, seal oil, fish oil, menhadden oil, bone tallow, olive oil, rosin, pearlash, silicate soda, caustic potash, caustic soda.

2. Soaps, various kinds, including soft, powder, ribbon, soft green, soft figged, shavings, glycerine, olive oil, compressed ribbon, brown, carbolic, transparent, mottled, cocoanut oil.

3. Carbolic preparations, including coal tar, tar oil, glacial C.A., medical C.A., refined C.A.; crystal C.A.; and sulphocarbolates of soda, zinc, ammonium, calcium, iron, lead, magnesium, potash. *F. C. Calvert and Co.*

1141 **Soaps and other Detergents**, including dog soap (Mackey's), liquid soap (Mouilla), Emulsion (Dr. Bonneford's), ointment (Jeye's), Eucalyptol powder (Mackey's), soft soap (Sanitas), furniture cleaner (Sanitas), sea salt (J. Pennes).

1142 **Soap Ingredients** at various stages of manufacture. *Ed. Cook and Co.*

1143 **Soaps,** various, including coal tar, carbolic potash (Mackey's), dog, animal, surgical, and disinfecting (Jeye's), antiseptic (Sanitas) Pixene (J. Wheeler).

1144 **Waste Products** from the manufacture of soap, including glycerine, lye, salts. *F. C. Calvert and Co.*

Antiseptics and Disinfectants.

1150 **Disinfectants, powerful or Germicides.** Capable of destroying the most resistant microbes, under certain stated conditions of strength, temperature, and time, including fire, boiling water, steam, hot dry air, perchloride of mercury, carbolic acid, cressol, iodine trichloride, osmic acid, permanganate of potash, iodine water, chlorine water, bromine water.

1151 **Disinfectants, weak.** Capable of destroying microbes which are not in the state of spore, including the powerful disinfectants more diluted, chloride of lime, hydrochloric acid, sulphurous acid, salicylic acid, chromic acid, creasote, caustic lime, soda, and potash.

1152 **Antiseptics.** Capable of impeding or arresting the growth of microbes, but without necessarily destroying them, including sul. zinc, chloride lime, sul. copper, sul. iron, perchloride iron, boracic acid, borax, carbolic oil,* thymol,* oil of turpentine,* Eucalyptus oil.

1153 **Aerial Deodorants**, for fumigation, with description for making and using the same. Chlorine gas, sulphurous acid, nitrous fumes, ozone, Euchlorine.

1154 **Apparatus for Fumigation.**

1155 **Powders for disinfecting purposes.** Manufactured and sold by the various makers whose names are given in brackets. Sanitary powder (Jeye's), Sanitas (Sanitas Co.'s), Eucalyptol (Mackey, Mackey and Co.), chloride lime (Greenbank Alkaline Co.), surgical and tooth powder (Jeye's), carbolic acid (Mackey and Co.), Pinewood and Eucalyptus (Mackey and Co.), Boro phenol (Calvert's), kanphorkalk (A. Hornby's).

1156 **Liquids for disinfecting purposes.** Manufactured and sold by the various makers whose names are given in brackets. Phenol (Bobemf's), perfect purifier (Jeye's), terebene (Cleaver's), eucalyptol, camphorine, sulphenic acid, oxychlorogene, cresylic acid, carbolic acid (Mackey, Mackey and Co.), Emulsion (Sanitas Co.), kresyline (Mackey's), pixine (J. Wheeler).

Disinfecting Apparatus.

1170 **Disinfecting Stove, self-regulating** (Dr. Ransom's design), large working model, for surgical, medical, and obstetric hospitals, and for public institutions, as erected at the General Hospital, Nottingham. *Goddard and Massey.*

1171 **Disinfecting Chamber** (Dr. Langstaff's design), with bath and lavatory (large model), for use of nurses and others after attending infectious cases. *C. F. Langstaff*, M.D.

1172 **Disinfector, steam** (Washington Lyon's), model in glass case, showing chamber and receiver for infected articles, steam generator, and all the details of registration and regulation. *W. Lyon.*

1173 **Disinfector.** Drawing of Goddard, Massey and Co.'s, showing a section through the disinfector with all the appliances for regulating pressure and heat, also sectional elevation showing flues, &c. *Goddard, Massey and Warner.*

1174 **Disinfector** (Soper's Patent). Models of portable and drain disinfectors. *Stiff and Sons.*

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* Chiefly used as deodorants for concealing odours.

ALPHABETICAL LIST OF NAMES AND ADDRESSES OF DONORS AND MANUFACTURERS.

Abbott, Van G., & Son, 6, Duke street Mansions, W.
Addlestone Linoleum Co., 4, Holborn Viaduct, E.C.
Admiralty, Lord Commissioners of (donor).
Ahrbecker, C. H., & Son, 35, Waterloo road, S.E.
Albion Lamp Co., 69, Hatton garden, E C.
Allen, J., & Sons, Marylebone lane, W.
Allen, Thomas, Bristol.
Anaglypta Co., 92, Great Russell street.
Angell, A. T., 14, Drayton gardens, Fulham road, S.W.
Archer Pipe Co., Avenue Mansions, Shaftesbury avenue.
Ashford & Co., Essex street, Birmingham.
Atkins, F. H., Farringdon street, E.C.
Aylesbury Dairy Co., St. Petersburg place, Bayswater.
Baatsch, C. (donor).
Bacon, G. W., & Co., Strand.
Bassett, W. J. (donor).
Banner Sanitation Co., 24, Craven street, W.C.
Barff, Prof. (donor).
Barnard, Bishop & Barnard, Norwich.
Barstow, T., Pontefract.
Baylis, C. O. (donor).
Baxendale & Co., Manchester.
Bellman & Co., Piccadilly.
Bird, Peter Hinckes (donor).
Blomfield, J. C. (donor).
Bolding, J., & Son, South Moulton street, W.
Bond, F. T. (donor).
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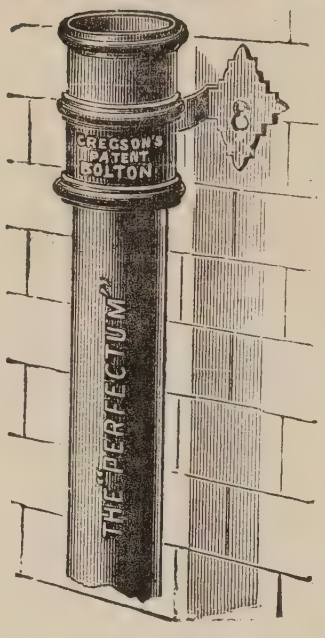

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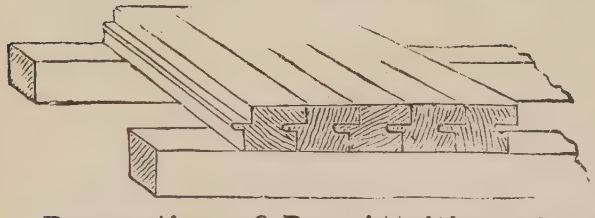

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PATENT DRAIN AND PIPE STOPPER.

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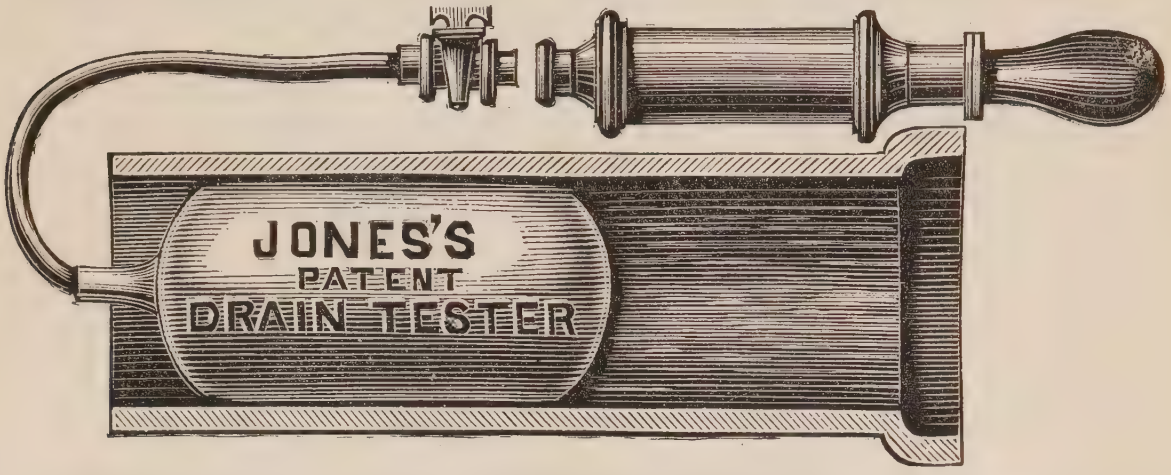

This invention consists of a cylindrical-shaped bag for stopping pipes for the purpose of testing, &c., with water, the soundness of drains, which is acknowledged to be the only reliable method. To the bag is attached a small flexible tube, with a tap at the end, connected to a small hand pump. The bag is placed in the drain before inflation, and by working the pump it is quickly filled with air, under sufficient pressure, to dam up the drain and prevent any escape of water. By turning the tap, the inflated bag remains in that state as long as required, and when done with, a half turn of the tap again releases the air, and is withdrawn. Amongst its advantages may be named its lightness and flexibility, enabling it to be folded and placed in a small bag; it can be placed in syphons and other traps, where all other stoppers fail.

PRICES ON APPLICATION.

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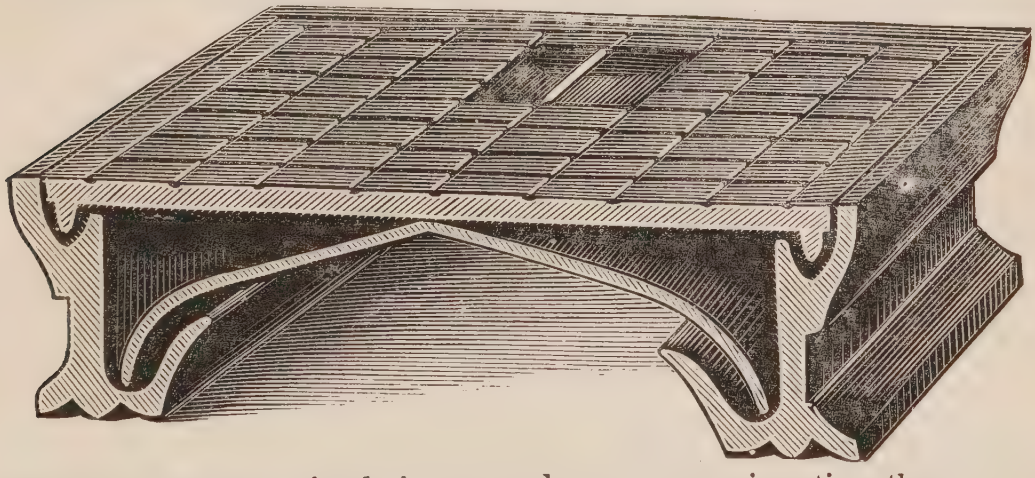

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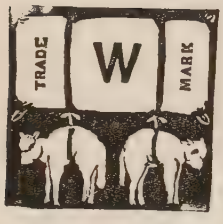

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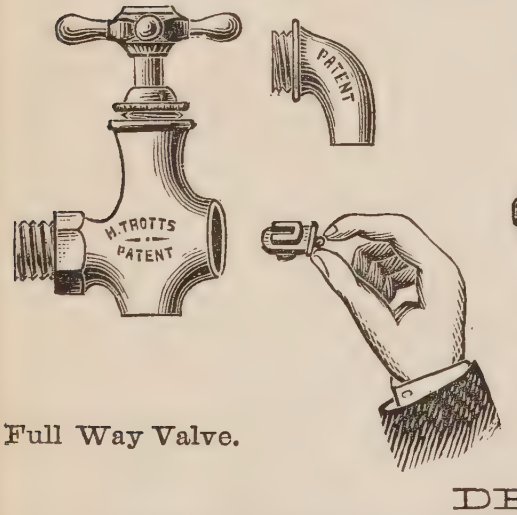
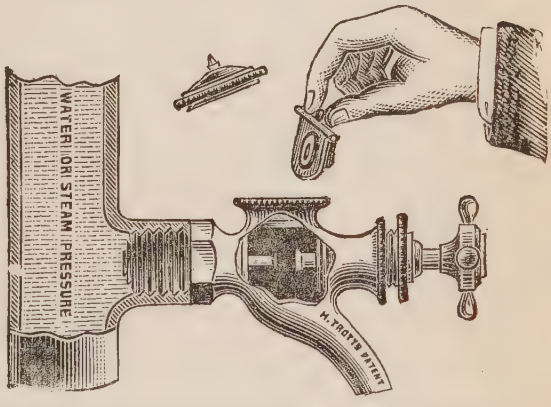


Full Way Valve.



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THE

"St. Bede Disinfectant."

(PATENTED. REGISTERED.)

A REAL DISINFECTANT!

Used by Medical Officers of Health.

TESTIMONIALS.

REPORT BY DR. EDWARD SEATON ON THE "ST. BEDE DISINFECTANT."

31st July, 1889.

Since it became established that the Per-Chloride of Mercury in the presence of a free acid, or its equivalent, was by far the most efficacious disinfectant, medical practitioners generally, and especially those who have to do with the prevention of fevers, have felt the great want of a convenient preparation which would contain the Per-Chloride of Mercury in the necessary strength together with a free acid, or its equivalent; and which would at the same time be in such a form as could be safely entrusted to Fever Nurses, Sanitary Inspectors and others by whom the processes of disinfection are usually carried out.

Such an article has now been prepared by the St. Bede Chemical Company. It is in the forms of blocks, each weighing an ounce, and each containing 17·5 grains, or 4 per cent. of Per-Chloride of Mercury. The block is composed mainly of anhydrous sodium sulphate (392·4 grains), with which is combined 24·5 grains of sulphuric acid; the acid sulphate thus formed appearing to act like a free acid, and to give to the Per-Chloride of Mercury its full disinfecting or germ-destroying power. The block contains also 2·2 grains of eucalyptus and thymol and ·9 grains of indigo, so that when dissolved it has a strong, but pleasant, smell and a bright blue colour. I have had several of these blocks submitted to me for analysis, experiment, and report. I find the proportion of the Per-Chloride of Mercury in each to be as stated, viz., 4 per cent., or 17 grains in the ounce block. The block is rather slowly soluble in a quart of water. The resulting blue solution is described as a very strong disinfectant. In order to test this I have made experiments in conjunction with Dr. Klein, to ascertain the effect of the solution on certain well known organisms which have been proved to be pathogenic or constantly present in zymotic diseases. The tests were made with the bacilli and spores of anthrax, also with the organisms present in cases of cholera and enteric fever. On adding three drops of the culture fluids of these organisms to three cubic centimetres of the blue solution, consisting of one block dissolved in a quart of water, the organisms were destroyed after only five minutes' exposure. This is a very severe test and shows that the blue solution is a very strong disinfectant for infected linen, blankets, &c. We further tested its power of disinfecting the evacuations of enteric fever and cholera. Sterilised fœcal matter in a fluid condition was inoculated with as much as one-seventh part of the culture fluid of the organisms present in enteric fever. To this mixture was added an equal quantity of the blue solution, and five minutes was found to be sufficient to destroy the organisms. I have also tested its antiseptic powers by dissolving blocks in putrescible fluids, and I found that one block dissolved in twenty-five quarts of a putrescible fluid, retarded decomposition five days; and that when dissolved in twelve and a half quarts, there was no sign of decomposition in the putrescible fluid after eight days. I further tested its power as a deodorant by noticing its effect upon heaps of fish refuse mixed with other decomposing animal and vegetable matters, and I found the solution was an excellent deodorant.

The preparation called the "St. Bede Disinfectant" has most powerful disinfecting and antiseptic properties, and is also a valuable deodorant. At the same time its colour and smell are quite sufficient safeguards against the possibility of its mistaken use. I have therefore no hesitation in strongly recommending it on public grounds.

(Signed) EDWARD SEATON, M.D., F.R.C.P.,
Fellow of the Institute of Chemistry.
Medical Officer of Health for Chelsea,
Lecturer on Sanitary Science and Public Health, St. Thomas' Hospital, London.

THE DETAILS OF THE EXPERIMENTS REFERRED TO IN DR. SEATON'S REPORT ARE AS FOLLOWS:—

The "St. Bede Disinfectant" was now in solution, one block being dissolved in one quart of water.

1.—The "killing power," i.e., the power to kill microbes, was tested on the following microbes: (A) bacillus anthracis without spores, (B) spores of bacillus anthracis, (C) the comma-bacillus found in Asiatic cholera, (D) the bacillus found in human typhoid fever.

Of normal cultivations in broth of these several microbes, about three drops were added to about three cubic centimetres of the disinfectant solution, well mixed, and after the lapse of five minutes, one to two drops of the mixture were added to tubes containing about 10 c.c. normal sterile beef broth; for control similar normal sterile beef broth was inoculated with a mere trace of the same culture fluids used for the above experiments. All broth tubes were placed in the incubator at 37° C., while all the control tubes showed already after twenty-four hours' copious typical growth of the several microbes, the others were perfectly clear and remained so afterwards. It follows from these experiments that five minutes' exposure of bacillus anthracis, of spores of bacillus anthracis, of the choleraic bacilli, and of the typhoid fever bacilli to the "St. Bede Disinfectant" solution is sufficient to kill these microbes.

2.—An important and extremely severe test of the killing power of the "St. Bede Disinfectant" solution was made in the following experiments:—

To normal human fœcal matter in thick solution, previously sterilised and contained in test tubes, was added a certain quantity of normal culture fluid of the choleraic bacilli and of the typhoid fever bacilli respectively, about one-seventh of the culture fluid being added to six-sevenths of the fœcal solution. After mixing well the disinfectant was added to each of the fœcal mixtures in equal proportions, so that each of the test tubes contained ½ of the fœcal matter plus culture fluid, and ½ of the disinfectant. After five minutes a number of test tubes containing sterile beef broth, as in the former series, were inoculated with a drop or two from these fœcal mixture tubes, then placed in the incubator and kept at 37° C., but no growth appeared in them and the fluids remained sterile. At the same time that the above experiments were made, control broth tubes were inoculated with a trace of the fœcal solution after the addition to them of the culture fluids, but before the addition of the disinfectant, these control tubes were also placed in the incubator and kept at 37° C., they all showed abundant normal growth after twenty-four hours of the choleraic bacilli and of the typhoid bacilli respectively.

(Signed) E. KLEIN, M.D., F.R.S.,
Professor of Bacteriology at the College of State Medicine, London.

LABORATORY AND ASSAY OFFICE,
75, THE SIDE, NEWCASTLE-UPON-TYNE,
July 6th, 1889.

I hereby certify that I have analysed a sample of the "St. Bede Disinfectant," manufactured by Messrs. The St. Bede Chemical Company (Limited), Newcastle-upon-Tyne, and that I find it contains as follows:—

Per-Chloride of Mercury	4·01 per cent.
Free Sulphuric Acid	4·10 ,,
Sulphate of Soda	87·25 ,,
Sulphate of Lime	1·30 ,,
Oxide of Iron, &c.	0·27 ,,
Chloride of Sodium	0·21 ,,
Insoluble Siliceous Matter	0·24 ,,
Thymol, Eucalyptus, Indigo, and Water	2·62 ,,
	100·00

The principal active ingredient of this disinfectant is Per-Chloride of Mercury (corrosive sublimate) which is known to be the most certain and powerful destroyer of disease germs. When the "St. Bede Disinfectant" is dissolved according to the instructions given it forms a solution of the strength and character recommended by Dr. Buchanan, the Medical Officer of the Local Government Board, as being effective as a disinfectant. It is prepared and packed in a form which makes it convenient and easy to be used.

(Signed) JOHN PATTINSON, F.I.C., F.C.S.
Public Analyst for Newcastle-upon-Tyne.

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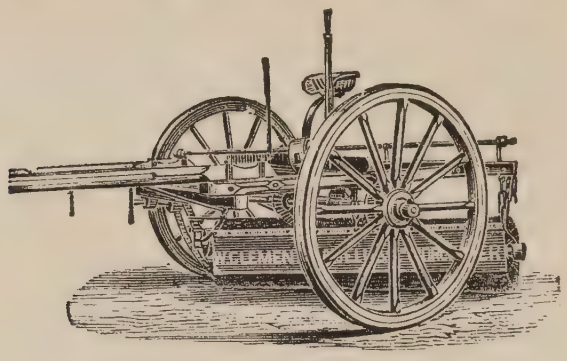

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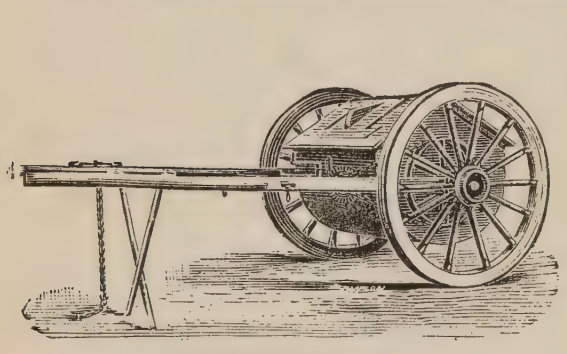

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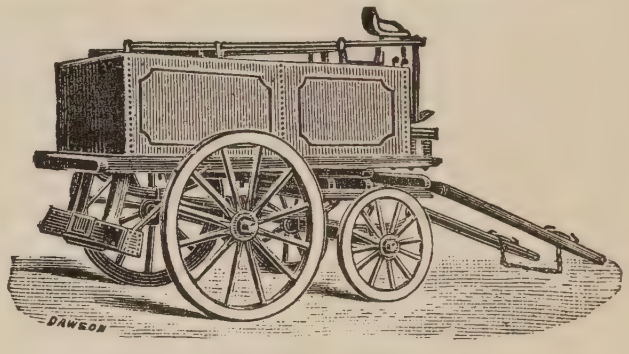

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